The ELECTRICAL REVIEW

TRADE NAMES SUPPLEMENT

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Name and Description.	Manufactured by or Obtainable from.
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A.C.E.C. Cables, electrical machinery, transformers	A.C.E.C., 56, Victoria St., London, S.W.1.
ACME Automatic time switches, Goliath and Edison screw lamp holders, lanterns for street lighting	The "Acme" Lighting & Engineering Co., Waverley Rd., St. Albans, Herts.
ACME Motor starting switches	Acme Electrical Mfg. Co., Tariff Rd., N.17.
A.D. Primary cells	Le Carbone, Coventry House, South Place, E.C.2.
ADANAC Switch with fuses	Berry's Electric, Ltd., 85-86, Newman St., Oxford St., W.1
ADAPTABLE Earthing clip	Hann & Ingle, 13, Albert Place, Bridge St., Manchester.
ADJUSTABLE Adaptor (two pin to B.C.)	A. P. Lundberg & Sons, Ltd., Pioneer Electrical Works, Paradise Passage, Sheringham Rd., N.7.
ADNIL Press-button switches of "ebolite	S. G. Leach & Co., Ltd., 26-30, Artillery Lane, E.1.
ADVANCE Flush and semi-recessed plug connectors	A. P. Lundberg & Sons, Ltd., Pioneer Electrical Works, Paradise Passage, Sheringham Rd., N.7.
A.E.G. Electrical machinery, domestic appliances, meters of all kinds	A.E.G. Machinery & Apparatus Co., Ltd., 131, Victoria St., S.W.1.
AEROFLEX Rewirable cartridge fuses with high-rupturing capacity	Parmiter, Hope & Sugden, Ltd., Fluvent Electrical Works, Vernon St., Longsight, Manchester.
AIRMAX Inductance coils	J. Dyson & Co., Ltd., 5 & 7, Godwin St., Bradford.
AJAX Ultra-violet ray (artificial sunlight) lamps, Sunviray and all electro-medical and hairdressing trade apparatus	Ajax, Ltd., 117, Central St., E.C.1.
AJAX-NORTHRUP Electric furnace, high frequency for steel, nickel silver, copper, platinum, &c.	Electric Furnace Co., Ltd., 17, Victoria St., S.W.1.
AJAX-WYATT Electric furnace, induction type for brass melting	Electric Furnace Co., Ltd., 17, Victoria St., S.W.1.
AKK-EMMAR Rectifiers for battery charging, kinema projectors, X-ray apparatus and all other non-inductive circuits	Automatic Rectifiers, Ltd., 75, Sancroft St., Lambeth, S.E.11.
ALKLUM Batteries (nickel-steel type)	Worsnop & Co., Ltd., Carlton Works, Halifax.
ALLIGATOR Belt fasteners	J. B. Stone & Co., Ltd., 135, Finsbury Pavement, E.C.2.
ALTON Storage batteries	The Alton Battery Co., Ltd., Alton, Hants.
ANCALITE Electric cables	Callender's Cable & Construction Co., Ltd., Hamilton House, Victoria Embankment, E.C.4.
ANCHORA Wood poles for transmission	Armstrong, Addison & Co., 17, North Bridge St., Sunderland.
ANTI-SULPHURIC Enamel	Griffiths Bros. & Co., London, Ltd., Macks Rd., S.E.16.
APEX Switch and fusegear	Foster Engineering Co., Ltd., Morden Works, Wimbledon, S.W.19.
ARCOVITE Arc shields, mouldings, sheets and tubes	Siluminite Insulator Co., Ltd., Erith, Kent.
ARGENTA Lamps	Philips Lamps, Ltd., 145, Charing Cross Rd., W.C.2.

NAME AND DESCRIPTION.	MANUFACTURED BY OR OBTAINABLE FROM.
ARMACELL Insulating varnish	Griffiths Bros. & Co., London, Ltd., Macks Rd., S.E.16.
ARMORDUCT Wires, cables, and flexibles	Armorduct Cable Co., Ltd., 159, Westminster Bdge. Rd., S.E.
ARON Electricity meters, kVA and kW M.D.I.'s, time switches, taximeters, &c.	Aron Electricity Meter, Ltd., 80, Salusbury Rd., Kilburn, N.W.6.
ARORA Electric fires, electric kettles, electrical cooking apparatus, industrial electric heaters	Arora Co., Rosebery St., Loughborough.
ARROW The complete line of wiring devices, reciprocating heating switches, &c.	S. G. Leach & Co., Ltd., 26-30, Artillery Lane, E.1.
ARTIC Switchboards, electric light fittings, &c.	Artic Fuse & Electrical Manufacturing Co., Ltd., Birtley, Co. Durham.
ARTIC Pressure contact self-aligning fuses, distribution gear, feeder pillars	Artic Fuse & Electrical Manufacturing Co., Ltd., Birtley, Co. Durham.
H. E. ASHDOWN (BIRMINGHAM), LTD. "Bakelite" mouldings and laminated stampings	H. E. Ashdown (Birmingham), Ltd., Perry Barr, Birminghan
H. E. ASHDOWN (BIRMINGHAM), LTD. Electric lighting fittings (Bakelite) ...	H. E. Ashdown (Birmingham), Ltd., Perry Barr, Birmingham
ATLAS Leclanché batteries	Atlas Carbon & Battery Co., Ltd., 56, Southwark Bridge Rd., S.E.1.
A.T.M. IN CIRCLE Telephone and telegraph equipment	Automatic Telephone Mfg. Co., Ltd., Strowger Works, Milton Rd., Edge Lane, Liverpool.
AUTO-COMBINATION Tumbler switch plugs	A. P. Lundberg & Sons, Ltd., Pioneer Electrical Works, Paradise Passage, Sheringham Rd., N.7.
AUTONOFF Time switch	Venner Time Switches, Ltd., 45, Horseferry Rd., S.W.1.
AUTOREELITE Combined spot light, trouble light, and portable light for motor-cars	Benjamin Electric, Ltd., Brantwood Works, Tariff Rd., N.17
AVERY Boiler scales, totalisers and coal weighers	W. & T. Avery, Ltd., Soho Foundry, Birmingham.
AVERY Water weighers, weighing machines, coal meters	W. & T. Avery, Ltd., Soho Foundry, Birmingham.
A.W.P. Electric arc welding supplies	Alloy Welding Processes, Ltd., 14-16, Church St., N.1.
BAA Accumulator acid	F. W. Berk & Co., Ltd., 106, Fenchurch St., E.C.3.
BAKELAQUE Insulating material	Attwater & Sons, Hopwood St. Mills, Preston.
BAKELITE Insulating varnish	Attwater & Sons, Hopwood St. Mills, Preston.
BAKELITE Mouldings and insulating material	The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.
BAKELITE Mouldings	M-L Magneto Syndicate, Ltd., Coventry.
BAKELITE Insulating materials	The Micanite & Insulators Co., Ltd., Empire Works, Blackhorse Lane, Walthamstow, E.17.
BAKELITE Mouldings and insulating materials	The Brownie Wireless Co., of Great Britain, Ltd., Nelson St Works, Mornington Crescent, N.W.1.
BAKELITE Synthetic resins, cement, silent gear material, &c.	Bakelite, Ltd., 68, Victoria St., S.W.1.
BAKELITE Moulding materials, laminated sheets, varnishes, &c.	Bakelite, Ltd., 68, Victoria St., S.W.1.
BALLSOK Admiralty pattern insulating beads...	Lionel Robinson & Co., 3, Staple Inn, W.C.1.
BATTERSEA Carbon brushes	Morgan Crucible Co., Ltd., Battersea Works, Church Rd., S.W.11.
BATWIN Motors	Power Contracts, Ltd., 138, Southwark St., S.E.1.
B.C.M./A.T.M. Telephone and telegraph equipment, electric domestic appliances, mine signalling apparatus	Automatic Telephone Mfg. Co., Ltd., Strowger Works, Milton Rd., Edge Lane, Liverpool.
B. & D. Electric drills	Gerrard & Co., Ltd., 15-19, Gt. Tichfield St., W.1.
BEACON Electric vacuum lamps	The Maybrook Elecl. Co., Ltd., 19-21, Wilson St., E.C.2.

NAME AND DESCRIPTION.	MANUFACTURED BY OR OBTAINABLE FROM.
BEANCO Switches	Baxendale & Co., Ltd., Miller St., Manchester.
BEANCO Dry cells	Baxendale & Co., Ltd., Miller St., Manchester.
BEANCO Lampholders	Baxendale & Co., Ltd., Miller St., Manchester.
B.E.C. Motors, starting gear, switchgear ...	British Electric Co., 25-29, Lower Rd., Rotherhithe, S.E.16.
BECOL Ebonite (made to Government specification)	British Ebonite Co., Ltd., Nightingale Rd., W.7.
BECOLATE High-temperature insulation material (made to Government specification)	British Ebonite Co., Ltd., Nightingale Rd., W.7.
B.E.L. Violet-ray high frequency and radiant heat apparatus	Bower Electric (1926), Ltd., 27, Ridinghouse St., Gt. Portland St., W.1.
B.E.L.L. Decorative and special lamps for reflector fittings, candelabra, &c.	British Electric Lamps, Ltd., Spencer Hill Rd., S.W.19.
BELLEROID Insulators	Barrett & Elers, Ltd., Dace Rd., E.3.
B.E.M. Motors	Brittain's Electric Motor Co., Eastdown Works, Dermody Rd., Lewisham, S.E.13.
BENCO Heavy duty B.C. & E.S. lampholders	Benjamin Electric, Ltd., Brantwood Works, Tariff Rd., N.17.
BENCOLITE Ornamental glass lighting unit for commercial installations	Benjamin Electric, Ltd., Brantwood Works, Tariff Rd., N.17.
BENGRIP B.C. adaptors with special cord grip features	Benjamin Electric, Ltd., Brantwood Works, Tariff Rd., N.17.
BENJAMIN Reflectors, industrial signals, automobile accessories, wireless, &c.	Benjamin Electric, Ltd., Brantwood Works, Tariff Rd., N.17.
BENJAMIN CLEARER TONE Anti-microphonic valve holders ...	Benjamin Electric, Ltd., Brantwood Works, Tariff Rd., N.17.
BERGMANN Fans, motors, cables	The Bergmann Electric Co., Ltd., 82, Victoria St., S.W.1.
BERLINER Automatic and telephone apparatus	Shipton Automatic Telephone System, Ltd., Caxton House, Tothill St., S.W.1.
BERRITE Insulating fabrics and varnishes, joint box and sealing compound	Berrite, Ltd., Yiewsley, Middlesex.
BERRY Transformers	British Electric Transformer Co., Ltd., Hayes, Middlesex.
BIBBY Couplings and air filters	Wellman Bibby & Co., Ltd., Victoria Station House, Victoria St., S.W.1.
BIFLECTOR Reflector fitting	Benjamin Electric, Ltd., Brantwood Works, Tariff Rd., N.17.
BIMETAL Non-oxidising, non-arcing fuse wire	Parmiter, Hope & Sugden, Ltd., Fluvent Electrical Works, Vernon St., Longsight, Manchester.
B.K.B. All classes of motors for d.c. and a.c. battery chargers for garage and house use, a.c. and d.c. generator sets, &c.	B.K.B. Electric Motors, Ltd., 200, High Holborn, W.C.1.
BLACKFRIARS Adhesive tape	Spicers, Ltd., 19, New Bridge St., E.C.4.
BLACKLEY Tape	Connolly's (Blackley), Ltd., Blackley, Manchester.
BLACO All-steel conduit fittings	F. C. Blackwell & Co., Ltd., Great Crosby Works, Liverpool.
BLAIZOLITE Adjustable patent projector lantern	Norrington & Landon, Ltd., 33, Brazennose St., Manchester.
BLAKE Insulated staples	Mosses & Mitchell, Ltd., 122-124, Golden Lane, E.C.1.
BLUE LABEL Dry cell	Standard Telephones & Cables, Ltd., Connaught House, Aldwych, W.C.2.
BOTRADE Switches and distribution boards ...	S. Bill & Co., Ltd., Queen's Rd., Aston, Birmingham.
BOYCE MOTO-METER Radiator temperature indicator ...	Benjamin Electric, Ltd., Brantwood Works, Tariff Rd., N.17.
BRITMAC Tumbler switches and lampholders	C. H. Parsons, Ltd., Britannia Works, Tyseley, Birmingham.
BRITTAIN Motors	Brittain's Electric Motor Co., Eastdown Works, Dermody Rd., Lewisham, S.E.13.
BROOK COMPLETE Lamp lock for use with standard lampholders	J. A. Brook, 24, John William St., Huddersfield.
BROWN-BOVERI Automatic pressure regulators ...	British Brown Boveri, Ltd., Trafalgar House, Waterloo Place, S.W.1.

NAME AND DESCRIPTION.	MANUFACTURED BY OR OBTAINABLE FROM.
BROWNIE Wireless receivers and components...	The Brownie Wireless Co. of Gt. Britain, Ltd., Nelson St. Works, Mornington Crescent, N.W.1.
BRUSH Tramcars, tramcar trucks, motor-'bus bodies	The Brush Electrical Engineering Co., Ltd., Falcon Works, Loughborough.
BRUSH Transformers, motors and generators, liquid starters	The Brush Electrical Engineering Co., Ltd., Falcon Works, Loughborough.
BRUSH-LJUNGSTROM Steam turbo-generators	The Brush Electrical Engineering Co., Ltd., Falcon Works, Loughborough.
BRUSTON Electric lighting plants, pumps, and refrigerators	G. C. Pillinger & Co., 53, Victoria St., S.W.1.
B.T.H. Electrical equipment	British Thomson-Houston Co., Ltd., Rugby.
BULL Motors and dynamos	Bull Motors, Ltd., Ipswich, England.
CABLEGRIP Cable boxes	W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1.
CAB TYRE Cab tire sheathed wires and cables	St. Helens Cable & Rubber Co., Ltd., Slough.
CAB TYRE Electrical cables	W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, London, E.C.1.
CAB TYRE Cab-tire sheathed wires and cables of all types	W. T. Glover & Co., Ltd., Trafford Park, Manchester.
CAB TYRE Cab-tyre sheathed cables and wires	Siemens Bros. & Co., Ltd., Woolwich, S.E.18.
CABTYRIT Corrosion-resisting rubber	St. Helens Cable & Rubber Co., Ltd., Slough.
CADURO Cadmium copper wire for trolley and transmission purposes	Richard Johnson & Nephew, Ltd., Bradford Iron Works, Manchester.
CALLENDER Electric cables of all types	Callender's Cable & Construction Co., Ltd., Hamilton House, Victoria Embankment, E.C.4.
CALORA Electric heating pads, foot-warming mats, &c.	M. E. du Bois & Co., 25, Redcross St., E.C.1.
CAMBRIDGE Instruments	Cambridge Instrument Co., Ltd., 45, Grosvenor Place, S.W.1.
CASTLE Dynamos and motors	J. H. Holmes & Co., Portland Rd., Newcastle-on-Tyne.
CECIL Resistances, fan regulators, dimmers	Mansell & Ogan, Ltd., 15-16, Floral St., Covent Garden, W.C.2.
CELEC Sliding resistances, dimmers, arc resistances, and charging boards	Curtis Mfg. Co., Ltd., Conduit Place, W.2.
CELERITY Rail grinders	Equipment & Engineering Co., 2 & 3, Norfolk St., W.C.2.
CENTURY D.c. volt-ammeter test set	Elliott Bros. (London), Ltd., Century Works, Lewisham, S.E.13.
C. & H. Electricity meters and instrument transformers	Chamberlain & Hookham, Ltd., Solar Works, New Bartholomew St., Birmingham.
C.H. Hand-operated and self-acting electric motor controlling apparatus and wireless components	Igranic Electric Co., Ltd., 149, Queen Victoria St., E.C.4.
CHANGE COIL Multi-range electrical testing set ...	Record Electrical Co., Ltd., Broadheath, Altrincham, Cheshire
CHASLYN S.O.S. AND VENT TYPE Hydrometer with gravity balls ...	J. H. Collie & Co., 10, Canning Place, Liverpool.
CHLORIDE Storage batteries	The Chloride Electrical Storage Co., Ltd., Clifton Junction, near Manchester.
CHROMALOX Electric heating units	Geo. Bray & Co., Ltd., Leeds.
CIRSCALE Electrical measuring instruments ...	Record Electrical Co., Ltd., Broadheath, Altrincham, Cheshire.
CITY Motors	City Electrical Co., 1, Emerald St., W.C.1.
CLARITONE Loudspeakers and headphones ...	Automatic Telephone Mfg. Co., Ltd., Milton Rd., Edge Lane, Liverpool.
CLASSIC Pulpit, desk, piano and organ fittings	The Lodge Fittings Co., Ltd., 57, Albert Rd., Aston, Birmingham.
CLEARER TONE Anti-microphonic valve holders ...	Benjamin Electric, Ltd., Brantwood Works, Tariff Rd., N.17.

NAME AND DESCRIPTION.	MANUFACTURED BY OR OBTAINABLE FROM.
CLEMATEITE Arc proof asbestos sheets and mouldings	Dacier, Ltd., 15-16, Jewry St., E.C.3.
COCUSITE Moulded bakelite material for accessories	A. P. Lundberg & Sons, Ltd., Pioneer Electrical Works, Paradise Passage, Sheringham Rd., N.7.
COLEC A system of heating combining central heating with electricity for topping up	Berry's Electric, Ltd., 85-6, Newman St., Oxford St., W.1.
COLUMBIA Red label dry cell batteries	J. R. Morris, 15, Kingsway, W.C.2.
COMPACTUM 2-valve set	The Edison Swan Electric Co., Ltd., 123-5, Queen Victoria St., E.C.4.
CORNWALL Regulators and dimmers	Donovan & Co., 47, Cornwall St., Birmingham.
COSMOS Cookers, domestic appliances, electric kitchen equipment, &c.	Metro-Vick Supplies, Ltd., 155, Charing Cross Rd., W.C.2.
COSMOS Lamps, fires, fans	Metro-Vick Supplies, Ltd., 155, Charing Cross Rd., W.C.2.
COSMOS Radiophones, radio valves and wireless apparatus	Metro-Vick Supplies, Ltd., 155, Charing Cross Rd., W.C.2.
COXPAR Voltage regulator	Cox-Walker & Partners, Darlington.
CRABTREE Accessories and switchgear	J. A. Crabtree & Co., Ltd., Lincoln Works, Walsall.
CRACORE Twin and three-core solid bitumen cables, cab tire sheathed trailing cables	W. T. Glover & Co., Ltd., Trafford Park, Manchester.
CRANE WITH ELECTRIC SYMBOL (DESIGN) Electric cranes, &c.	S. H. Heywood & Co., Ltd., Reddish, Stockport.
CREDA Heating and cooking apparatus ...	Credenda Conduits Co., Ltd., Oldbury, Birmingham.
CRESSALL Resistance nets, regulators, unit heaters	Cressall Mfg. Co., Eclipse Works, 31 & 32, Tower Street, Birmingham.
CROWN Cables, tape and wire	Foster Engineering Co., Ltd., Morden Works, Wimbledon, S.W.19.
CROYDON Searchlight projectors	London Electric Firm, Brighton Rd., South Croydon.
CROYDON Portable household electric vacuum cleaner	Croydon Engg. Co., Ltd., Victory Works, Gloucester Rd., Croydon.
CRYPTO Generators and motors (a.c. and d.c.), constant potential equipments, commutating rectifiers, cinema arc sets, &c.	The Crypto Electrical Co., Ltd., Acton Lane, Willesden, London, N.W.10, associated with The Lancashire Dynamo and Motor Co., Ltd., Trafford Park, Manchester.
CRYSELCO Electric lamps	Cryselco, Ltd., Kempston Works, Bedford.
C.T.S. Cab tyre sheathed cables	St. Helens Cable & Rubber Co., Ltd., Slough.
C.T.S. Electrical cables	W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1.
C.T.S. Cab-tyre sheathed wires and cables of all types	W. T. Glover & Co., Ltd., Trafford Park, Manchester.
C.T.S. Cab-tyre sheathed cables	Siemens Bros. & Co., Ltd., Woolwich, S.E.18.
CUMULUS Electric water heaters	Nathan & Allen, Ltd., 25, Victoria St., London, S.W.1.
DAMARDA Lacquer	Bakelite, Ltd., 68, Victoria St., S.W.1.
DANIA Dry cells	Atlas Carbon & Battery Co., Ltd., 56, Southwark Bridge Rd., S.E.1.
DECO Control devices for handling plants	Dalyte Electrical Co., Deco Engg. Works, West Row, N. Kensington, W.10.
DELTA Bell batteries	Falk, Stadelmann & Co., Ltd., Efesca Electrical Works, 83-93, Farringdon Rd., E.C.1.
DERI Motors, single and multi-phase, variable speed	British Brown Boveri, Ltd., Trafalgar House, Waterloo Place, S.W.1.
DESCO Fuses, distribution gear and switchboards	G. P. Dennis, Ltd., 66, South John St., Liverpool.
DIALITE Electric cables	St. Helens Cable & Rubber Co., Ltd., Slough.
DIAMOND Seal padlocks for slot meters	The Tourtel Mfg. Co., 48, Uxbridge Rd., Ealing, W.5.

NAME AND DESCRIPTION.	MANUFACTURED BY OR OBTAINABLE FROM.
DIAMOND H Switches all types, temperature control apparatus	Hart Manufacturing Co., 76-76b, Rochester Row, S.W.1.
DIATRINE Diatrine paper-insulated cable ...	W. T. Glover & Co., Ltd., Trafford Park, Manchester.
DICTOGRAPH House and office telephones	Dictograph Telephones, Ltd., Aurelia Rd., Croydon.
DIM-A-LAMP Portable lamp with dimming device	Benjamin Electric, Ltd., Brantwood Works, Tariff Rd., N.17.
DIM-A LITE Adaptor lampholder with dimming device	Benjamin Electric, Ltd., Brantwood Works, Tariff Rd., N.17.
DOT Two-pin plug connectors and switch plugs	A. P. Lundberg & Sons, Ltd., Pioneer Electrical Works, Paradise Passage, Sheringham Rd., N.7.
DOWSING'S Electric heating and medical appliances	Dowsing Radiant Heat Co., Ltd., Bollo Lane, Acton, W.3, and 91-3, Baker St., W.1.
D.P. Storage batteries	The D.P. Battery Co., Ltd., Bakewell, Derbyshire.
DRAKA Cables	Electric Cables, Ltd., 88, Golden Lane, E.C.1.
DUFLEX Control of pendulums in existing turret clocks	Gent & Co., Ltd., Faraday Works, Leicester.
DUNDEE Tapes	William Geipel, Ltd., Vulcan Works, 156-170, Bermondsey St., S.E.1.
DUO-SAVELITE Double filament lamp	Philips Lamps, Ltd., 145, Charing Cross Rd., W.C.2.
DUPLEX Two-way tumbler switch with "off" position	A. P. Lundberg & Sons, Ltd., Pioneer Electrical Works, Paradise Passage, Sheringham Rd., N.7.
DUREX Electric wiring system for C.T.S. or L.C. cables	Simplex Conduits, Ltd., Garrison Lane, Birmingham.
E Control gear, &c.	Geo. Ellison, Perry Barr, Birmingham.
EARTHING CLIPS Copper earthing clips, patent anti-vibration earth clips and adjustable earth clips	The Earthing Clip Co., 71, Hatherly St., Princes Rd., Liverpool.
EBBINITA Mouldings (not fireproof)	Siluminite Insulator Co., Ltd., Erith, Kent.
EDISWAN Dry batteries	The Edison Swan Electric Co., Ltd., 123-5, Queen Victoria St., E.C.4.
EDISWAN Valves	The Edison Swan Electric Co., Ltd., 123-5, Queen Victoria St., E.C.4.
EDISWAN HYMEG H.T. accumulators	The Edison Swan Electric Co., Ltd., 123-5, Queen Victoria St., E.C.4.
EDISWAN LOTEN L.T. accumulators	The Edison Swan Electric Co., Ltd., 123-5, Queen Victoria St., E.C.4.
E. & E. Railway and tramway specialities ...	Equipment & Engineering Co., 2 & 3, Norfolk St., W.C.2.
EELEX Small wireless and electrical components and accessories	J. J. Eastick & Sons, 118, Bunhill Row, E.C.1.
EFCO Resistance furnace, Wild-Barfield and non-metallic resistor types	Electric Furnace Co., Ltd., 17, Victoria St., S.W.1.
EFESCA Switches, batteries, lampholders ...	Falk, Stadelmann & Co., Ltd., Efesca Electrical Works, 83-93, Farringdon Road, E.C.1.
ELASTRONG Mechanical rubber	St. Helens Cable & Rubber Co., Ltd., Slough.
ELASTUMEN Cable	Johnson & Phillips, Ltd., Charlton, S.E.
ELECT Cooking and heating apparatus, ovens, irons, fires, &c.	Electric Heating Co., George St., Croydon.
ELECTRICOAL (HEATRAE) Imitation coal fires	Electric Fires, Ltd., Heatrae Works, Norwich.
ELECTRIC TRANSMISSION Transmission line accessories, bushings, pole top switchgear	Electric Transmission, Ltd., Culford Works, Kingsbury Rd., Dalston, N.1.
ELECTROART Hand painted, parchment, vellum and fabricette lampshades	Electric Art Shades (1926), Witham, Essex.
ELECTROFLO Industrial instruments	Electroflo Meters Co., Ltd., Abbey Rd., Park Royal, N.W.10
ELEPHANTIDE Insulating pressboards	B. S. & W. Whiteley, Ltd., Pool, Nr. Leeds.

NAME AND DESCRIPTION.	MANUFACTURED BY OR OBTAINABLE FROM.
ELGEE Meters, time switches, recording instruments	Landis & Gyr, Ltd., Elgee Works, Victoria Rd., North Acton, W.3.
ELIMINAIR Feed water deaerator	Richardsons, Westgarth & Co., Ltd., Hartlepool.
ELIXUM Quick make and break switch and fuse, ironclad fuses	Sykes & Dyson, Ltd., Queen's Mill Rd., Huddersfield.
ELLIOTT Electrical measuring instruments of all kinds	Elliott Bros. (London), Ltd., Century Works, Lewisham, S.E.13.
ELLISON Circuit breakers, electric	Geo. Ellison, Perry Barr, Birmingham.
ELLISON Plastic insulating compound, formerly known as "Plastol"	Geo. Ellison, Perry Barr, Birmingham.
ELLMAR Moulded pressings in bakelite and similar materials, insulating parts, &c.	The Ellmar Mouldings Co., Thimble Mill Lane, Birmingham.
ELWELL-PARKER Electric truck	Gillespie Partners, Ltd., Cecil House, Holborn Viaduct, E.C.1.
EMB Tramway trucks and brakes, electric control and starting gear, unbreakable, jointless and rustless grid type resistances	The Electro-Mechanical Brake Co., Ltd., Eagle Works, West Bromwich.
EMPIRE Insulating cloth and tape	Attwater & Sons, Hopwood Street Mills, Preston.
EMPIRE Insulating cloths, tapes, silks, papers and tubes	The Micanite & Insulators Co., Ltd., Empire Works, Blackhorse Lane, Walthamstow, E.17.
EMPIRE Automatic controllers, high tension fuses, overhead h.t. line equipment	Electric Control, Ltd., "Empire" Works, Bridgeton, Glasgow.
EMVEE Lampholders, switches and general accessories	Metro-Vick Supplies, Ltd., 155, Charing Cross Rd., W.C.2.
ENA Electric fires, electric heating elements	Ena Electrical Appliances, Ltd., 62, Englefield Rd., N.1.
ENDOLAC High grade black spirit insulating varnish for finishing coat on armatures and fields	Pinchin, Johnson & Co., Ltd., General Bldgs., Aldwych, W.C.2.
ENDURAL Special cables and compound	W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1.
ENFIELD Cables	The Enfield Cable Works, Ltd., Lincoln House, 292-302, High Holborn, W.C.1.
ENSIGN Lampholders and wall plugs	The General Accessories Co., Ltd., "Genex" House, 18-22, Euston Buildings, N.W.1.
E.P.S. Accumulators	Pritchett & Gold & E.P.S. Co., Ltd., 50, Grosvenor Gdns., S.W.1.
EQUATORIAL Cable	W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1.
EQUILUXO A special type of glassware	The General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.
ERICSSON Telephones and wireless apparatus...	Ericsson Telephones, Ltd., 67-73, Kingsway, W.C.
"E.S." (monogram) Edison Swan products	Edison Swan Electric Co., Ltd., 123-5, Queen Victoria St., E.C.4.
ESLA Street lighting equipment	Electric Street Lighting Apparatus Co., The Foundry, Canterbury.
ESSELL Insulating varnished cloth, papers, tapes, &c.	Spicers, Ltd., 19, New Bridge St., E.C.4.
EVER READY Dry cells, batteries, and electric lamps (portable)	Ever Ready Co. (Gt. Britain), Ltd., Hercules Place, N.7.
EVERAY High frequency, violet ray apparatus	I. Calvete, Ltd., 11, Little Saint Andrew St., St. Martin's Lane, W.C.2.
EXALT Flat switches	The General Accessories Co., Ltd., "Genex" House, 18-22, Euston Buildings, N.W.1.
EXAUTO Time switch	Venner Time Switches, Ltd., 45, Horseferry Rd., S.W.1.
EXCELLO Arc lamps	Korting & Mathiesen Electrical Co., Ltd., 711 & 715, Fulham Rd., S.W.6.
EXIDE Storage batteries	The Chloride Electrical Storage Co., Ltd., Clifton Junction, near Manchester.

NAME AND DESCRIPTION.	MANUFACTURED BY OR OBTAINABLE FROM.
EXIDE-IRONCLAD Storage batteries	The Chloride Electrical Storage Co., Ltd., Clifton Junction, near Manchester.
EXPOMETER Exposure meters for automatically controlling ultra-violet ray apparatus	Bower Electric (1926), Ltd., 27, Ridinghouse St., Gt. Portland St., W.1.
EXPRESO (Pat.) Flat switches, quick make and break	The General Accessories Co., Ltd., 125, High Holborn, London, W.C.1.
FABROIL Non-metallic gears	British Thomson-Houston Co., Ltd., Rugby.
FAIRYLAND Lighting strip	Imperial Lighting Co. (Implitico), Ltd., 2-6, Pocock St., S.E.1.
F.A.P. Conduit and fittings and accessories	Fitter & Poulton, Ltd., Vincent Parade, Balsall Heath, Birmingham.
FARRINGDON Bells	Falk, Stadelmann & Co., Ltd., Efesca Electrical Works, 83-93, Farringdon Rd., E.C.1.
FIBRE Insulating materials	Mosses & Mitchell, Ltd., 122-124, Golden Lane, E.C.1.
FIBRESTOS Fireproof sheets	Siluminite Insulator Co., Ltd., Erith, Kent.
F.I.L. High tension suspension insulators ...	William Geipel, Ltd., Vulcan Works, 156-170, Bermondsey St., S.E.1.
FIRIMINE Fuse switches	Berry's Electric, Ltd., 85-6, Newman St., Oxford St., W.1.
FISH-SPINE Admiralty-pattern porcelain insulating beads	Taylor, Tunnicliff (Refractories), Ltd., 110, Cannon St., E.C.4
FLAMINGO Electric fires	British Electric Transformer Co., Ltd., Wellington House, 125-130, Strand, W.C.2.
FLEXOTUBE Insulated sleeving	John MacLennan & Co., 115, Newgate St., E.C.1.
FLEXTOL Power driven hand tools	S. H. Morden & Co., Ltd., Morden House, 18, Dartmouth St., S.W.1.
FLUVENT Distribution fuse boxes	Parmiter, Hope & Sugden, Ltd., Fluvent Electrical Works, Vernon St., Longsight, Manchester.
FLY Magicoal fire	Berry's Electric, Ltd., 85-6, Newman St., Oxford St., W.1.
FORMAPEX Insulating varnish, moulding mixtures, miocarta sheet and tubes	Ioco Rubber & Waterproofing Co., Ltd., Netherton Works, Anniesland, Glasgow, W.3.
FORMITE Bakelite moulding materials	Bakelite, Ltd., 68, Victoria St., S.W.1.
FOSTER Transformers, tanks, &c.	Foster Engineering Co., Ltd., Morden Works, Wimbledon, S.W.19.
FOSTER Lanterns and electric accessories ...	Foster Engineering Co., Ltd., Morden Works, Wimbledon, S.W.19.
F.R.—B'HAM Copper earth clips and other accessories	F. Ryman, 116, Livery St., Birmingham.
FRANCIS Lamp lock	Francis Lamp Locks, Ltd., 83, Pall Mall, S.W.1.
FREDENNIS Telephone and telegraph wires, cables, insulators and accessories	W. F. Dennis & Co., 70, Queen Victoria St., E.C.4.
FRIGID Fans of all types and sizes	Electroservice, Ltd., 3, Waterloo Road, S.E.1.
FULLER Storage batteries, primary batteries, loud speakers and trickle chargers	Fuller Accumulator Co. (1926) Ltd., Woodland Works, Chadwell Heath, Essex, London, E.
FULLOLITE Lamps	Edison Swan Electric Co., Ltd., 123-5, Queen Victoria St., E.C.4.
FURSE Cinema curtain controllers and dimmers, organ and orchestra lifts	W. J. Furse & Co., Ltd., Traffic St., Nottingham.
GAMEWELL Fire alarm systems	Standard Telephones and Cables, Ltd., Connaught House, Aldwych, W.C.2.
GARDY Rotary switches and fuses	Thompson & Co., 1 & 3, Old Swan Lane, E.C.4.
GEAR SHIELD Gear-saving lubricant	Fred. J. Down, 90-93, Fenchurch St., E.C.3.
GECOFIX Electric light fittings of every description	The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.
GECORAY Reflectors for shop-window lighting	The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.
GEE-GEE. Water heaters, immersion heaters, wash boilers, &c.	George Green & Co., 40, Aybrook St., W.1.

NAME AND DESCRIPTION.	MANUFACTURED BY OR OBTAINABLE FROM.
GENACCO Electric lighting accessories	The General Accessories Co., Ltd., 125, High Holborn, London, W.C.1.
GENEX Electric lighting accessories	The General Accessories Co., Ltd., "Genex" House, 18-22, Euston Buildings, N.W.1.
GENII Geysers, water heaters, stills, radiators, thermostats, &c.	Geo. Nobbs, Ltd., 89, Cleveland St., Fitzroy Sq., W.1.
GILSONITE Asphaltum, bitumen	Ashby, Morris, Ltd., 17, Laurence Pountney Lane, E.C.4.
GLASGOW-REX Ironclad switches	Midland Electric Mfg. Co., Ltd., M.E.M. Works, Barford St., Birmingham.
GLIMALAC For making up mica plates or material commonly called micanite	Pinchin, Johnson & Co., Ltd., General Bldgs., Aldwych, W.C.2.
GLOBAR Non-metallic electric heating elements, resistances and furnaces	British Resistor Co., Ltd., Clare Road, Halifax, England.
GLO-CLAD Watertight and gastight electric lighting system	W. T. Glover & Co., Ltd., Trafford Park, Manchester.
GLOVERITE Insulated wires and cables for signalling and special situations	W. T. Glover & Co., Ltd., Trafford Park, Manchester.
GLOVERS Electric wires, cables and lead rubber-covered house wiring systems	W. T. Glover & Co., Ltd., Trafford Park, Manchester.
GLOVOX Compound insulated mains cables ...	W. T. Glover & Co., Ltd., Trafford Park, Manchester.
GOBLIN Electric suction cleaner	British Vacuum Cleaner & Engineering Co., Ltd., Parsons Green Lane, S.W.6.
GODWINEX Radio and electrical apparatus ...	J. Dyson & Co., Ltd., 5 & 7, Godwin St., Bradford.
GRAHAM Naval telephones, band repeater and docking order equipment.	Alfred Graham & Co., Ltd., St. Andrew's Works, Slough, Bucks.
GRIPTITE Adhesive tape	Spicers, Ltd., 19, New Bridge St., E.C.4.
HÆTANIC Nickel chrome high resistance wire	L.P.S. Electrical Co., Ltd., Avenue Rd., Acton, W.3.
HAILGLASS Glassware	Hailwood & Ackroyd, Ltd., Beacon Works, Morley, Nr. Leeds.
HARCOURT Artistic electric light fittings, door furniture and switch plates	Metro-Vick Supplies, Ltd., 145, Charing Cross Rd., W.C.2.
HARPOON Guy anchors for staying poles, &c. ...	Fred. J. Down, 90-93, Fenchurch St., E.C.3.
HART Electrical accumulators	Hart Accumulator Co., Ltd., Marshgate Lane, E.15.
HAZEMEYER Switchgear, &c.	Alan Wright, 124, Chancery Lane, W.C.2.
HEATRAE Oil heaters, small cookers, hot pipes	Electric Fires, Ltd., Heatrae Works, Norwich.
HEATRAE Electric fires, immersion heaters, water heaters	Electric Fires, Ltd., Heatrae Works, Norwich.
H.E.C. Static transformers	Hackbridge Electric Construction Co., Ltd., Hersham, Walton-on-Thames.
HELENITE Electric cables	St. Helens Cable & Rubber Co., Ltd., Slough.
HELSBY Condensers for telephone, telegraph and power factor improvement	British Insulated Cables, Ltd., Helsby, near Warrington.
HELSBY Cords (telephone and switchboard) ...	British Insulated Cables, Ltd., Helsby, near Warrington.
HELSBY Rubber-insulated cables	British Insulated Cables, Ltd., Helsby, near Warrington.
HELSBY Wiring systems	British Insulated Cables, Ltd., Helsby, near Warrington.
HENDON Lamps, domestic utilities, &c. ...	The Hendon Elec. Lamp Co., Ltd., 104, Southampton Row, W.C.1.
HENLEX Special compound insulation	W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1.
HENLEY Link disconnecting boxes	W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1.
HENLEY Distribution pillars	W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1.
HENLEY Tape	W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1.

NAME AND DESCRIPTION.	MANUFACTURED BY OR OBTAINABLE FROM.
HENLEY Cables of all types	W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1.
HENLEY Joint box compounds	W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1.
HENLEY Plywood backboards	W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1.
HENLEY WIRING SYSTEM Special wiring system and fittings ...	W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1.
HERCULENE Electric cables	W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1.
HEROULT Electric furnace, arc type for steel and nickel melting	Electric Furnace Co., Ltd., 17, Victoria St., S.W.1.
HINGELESS Fuseboard (non-corrodible, detachable)	S. Bill & Co., Ltd., Queen's Rd., Aston, Birmingham.
HITEST Cables	Falk, Stadelmann & Co., Ltd., Efesca Electrical Works, 83-93, Farringdon Rd., E.C.1.
HOFFMANN Ball and roller bearings, steel balls and rollers	Hoffmann Mfg. Co., Ltd., Chelmsford, Essex.
HOLOPHANE Prismatic illuminating glassware ...	Holophane, Ltd., Elverton St., Vincent Sq., S.W.1.
HOME OFFICE Lamp lock for use with Home Office lampholders	J. A. Brook, 24, John William St., Huddersfield.
HOPKINSON OR H.I.M. Alternating-current motors	Hopkinson Induction Motors, Park Royal Rd., North Acton, W.3.
HOT-POINT Electric irons, soldering irons and branders	Dowsing Radiant Heat Co., Ltd., Bollo Lane, Acton, W.3, and 91-3, Baker St., W.1.
HOTPOINT Domestic electric appliances	Hotpoint Electric Appliance Co., Ltd., 24, Newman St., Oxford St., W.1.
HOTPOINT-FALCO Electric cookers	Hotpoint Electric Appliance Co., Ltd., 24, Newman St., Oxford St., W.1.
H.W.S. Special wiring system and fittings ...	W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct. E.C.1.
HYPER-SCALE Electrical measuring instruments ...	Nalder Bros. & Thompson, Ltd., 97a, Dalston Lane, E.8.
ICALL Electro-medical apparatus, electrical equipment for hairdressers	I. Calvete, Ltd., 11, Little Saint Andrew St., St. Martin's Lane, W.C.2.
IDEAL Electrical measuring instruments and relays of all types	Nalder Bros. & Thompson, Ltd., 97a, Dalston Lane, E.8.
I. & F. Controller fingers, contacts and colliery coal-cutter spares and renewals	Imeson & Finch, "Empress" Works, Stockton-on-Tees.
IGRANIC All types of electric motor starting and motor controlling apparatus and wireless components	Igranic Electric Co., Ltd., 149, Queen Victoria St., E.C.4.
IGRANIC-PACENT Radio components for wireless receiving sets	Igranic Electric Co., Ltd., 149, Queen Victoria St., E.C.4.
IMP Flat tumbler switches and switch plugs	A. P. Lundberg & Sons, Ltd., Pioneer Electrical Works, Paradise Passage, Sheringham Rd., N.7.
IMPERIAL Conduit tubes and accessories ...	Isaac Griffiths & Sons, Imperial Works, Wednesbury, Staffs
IMPERIAL Electric stage equipment	Imperial Lighting Co. (Implitico), Ltd., 2-6, Pocock St., S.E.1.
IMPREGNITE Black, solid, impregnating compound for treating all types of coils having a great depth of wire	Pinchin, Johnson & Co., Ltd., General Bldgs., Aldwych, W.C.2.
INDESTRUCTIBLE Non-pitting or burning starting and control gear	The Scottish Electric Co., Ltd., "Guildhall Works," Erskine St., Dundee.
INKWELL Recording instruments	Everett, Edgcumbe & Co., Ltd., Colindale Works, Hendon, N.W.9.
INTERMEDIATE Tumbler switch for control of lamps from more than two positions	A. P. Lundberg & Sons, Ltd., Pioneer Electrical Works, Paradise Passage, Sheringham Rd., N.7.
INTERNATIONAL ELECTRIC CO., LTD. Automatic telephones, intercommunicating telephones, loudspeakers, &c.	International Electric Co., Ltd., 161a-166, Strand, W.C.2.

NAME AND DESCRIPTION.	MANUFACTURED BY OR OBTAINABLE FROM.
INVENTUM Fans, cookers, water heating and domestic appliances	Alan Wright, 124, Chancery Lane, W.C.2.
INVENTUM Electric fires, electric water taps, electric cisterns	W. C. Yuille & Co., Ltd., 155a, St. Vincent St., Glasgow, C.2.
INVENTUM Electric fires, water heating and cooking appliances	Inventum Electrical Appliances, Sales Dept., 124, Chancery Lane, W.C.2. (Alan Wright, Sole Agent Gt. Britain and Colonies.)
IRONSAFE Switchboards	Berry's Electric, Ltd., 85-6, Newman St., Oxford St., W.1.
ISCO Ironclad service cutouts	W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1.
ISOLAC An acid and waterproof, air drying and baking insulating varnish of high electrical resistance, and permanent plasticity	Pinchin, Johnson & Co., Ltd., General Bldgs., Aldwych, W.C.2.
JACELITE Moulded accessories	J. A. Crabtree & Co., Ltd., Lincoln Works, Walsall.
JACKSON Electric cookers, fires, kettles, breakfast cookers, &c.	The Jackson Electric Stove Co., Ltd., 143, Sloane St., S.W.1.
J.K.W. Solid contact lampholders	J.K.W. Manufacturing Co., Ltd., Bridge Works, Warrenby, Redcar, Yorks.
J. & P. Wiring system	Johnson & Phillips, Ltd., Charlton, S.E.
JUBILEE Worm-drive earthing clips	L. Robinson & Co., "London Chambers," Gillingham, Kent.
KALANITE Insulating material	Callender's Cable & Construction Co., Ltd., Hamilton House, Victoria Embankment, E.C.4.
KALANOID Plastic waterproof compound	Callender's Cable & Construction Co., Ltd., Hamilton House, Victoria Embankment, E.C.4.
KALECORE Electric cables	Callender's Cable & Construction Co., Ltd., Hamilton House, Victoria Embankment, E.C.4.
KALEECO Electric wiring system	Callender's Cable & Construction Co., Ltd., Hamilton House, Victoria Embankment, E.C.4.
KALIBOND Lead-sheathed cable having special bonding wire	Callender's Cable & Construction Co., Ltd., Hamilton House, Victoria Embankment, E.C.4.
KANDEM Lighting fittings, electricity meters and arc lamps for all purposes	Korting & Mathiesen Electrical, Ltd., 711 and 715, Fulham Rd., S.W.6.
KANGAROO Electric radiator	Berry's Electric, Ltd., 85-6, Newman St., Oxford St., W.1.
KANTARK Fuses, cut-outs and distribution boards	Midland Electric Mfg. Co., Ltd., M.E.M. Works, Barford St., Birmingham.
KATHANODE Storage batteries	The D.P. Battery Co., Ltd., Bakewell, Derbyshire.
KAYBEE Wash boiler	Armature Winding Co., Ltd., Castle Grounds, Bury, Lancs.
KAY-EF-EM INTERNALITE Signs and motor-car accessories ...	K.F.M. Engineering Co., Ltd., 29-31, Portugal St., Kingsway, W.C.2.
KEY FIBRE CONDUIT Conduit for underground cables and bird guards	Key Engineering Co., Ltd., 4, Queen Victoria St., E.C.4.
KILARC Positive action quick make and break tumbler switches	A. P. Lundberg & Sons, Ltd., Pioneer Electrical Works, Paradise Passage, Sheringham Rd., N.7.
KINARKO Carbons for cinematograph work, &c.	The General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.
KINGOLITE Electric candles	Edison Swan Electric Co., Ltd., 123-5, Queen Victoria St., E.C.4.
KINGSWAY Combined switch and plug	The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.
KLYMAX Single and two-way narrow-panel tumbler switches	A. P. Lundberg & Sons, Ltd., Pioneer Electrical Works, Paradise Passage, Sheringham Rd., N.7.
KOMET Electric heating appliances	Electric Heating & Hardware, Ltd., Crown Works, Berkley St., Birmingham.
KONE Loud speaker	Standard Telephones & Cables, Ltd., Connaught House, Aldwych, W.C.2.
KONFORM Switch plug	Berry's Electric, Ltd., 85-6, Newman St., Oxford St., W.1.
LANCASHIRE Generators and motors, synchronous motors, turbo-alternators, &c.	Lancashire Dynamo & Motor Co., Ltd., Trafford Park, Manchester, associated with The Crypto Electrical Co., Ltd., Acton Lane, Willesden, N.W.10.

NAME AND DESCRIPTION.	MANUFACTURED BY OR OBTAINABLE FROM.
LATASCALE Indicating instruments	Elliott Bros. (London), Ltd., Century Works, Lewisham, S.E.13.
LAURIE & INGLEFIELD Travelling lights and stretching pendants	Thos. Laurie & Co., Ltd., West End, Falkirk.
LEATHEROID Insulating materials	Mosses & Mitchell, Ltd., 122-124, Golden Lane, E.C.1.
LEATHEROID Insulating materials	Attwater & Sons, Hopwood St. Mills, Preston.
LEATHEROID Insulating materials	The Micanite & Insulators Co., Ltd., Empire Works, Blackhorse Lane, Walthamstow, E.17.
L.E.C. Switchgear, conduits, cables and wireless accessories	The London Electrical Co., 1, Sherborne Lane, E.C.4.
LECITE (Regd.) CABLES Wires and cables	The Liverpool Electric Cable Co., Ltd., Linacre Lane, Bootle, Liverpool.
LEKTRIK Switches, plug connectors and kindred accessories	A. P. Lundberg & Sons, Ltd., Pioneer Electrical Works, Paradise Passage, Sheringham Rd., N.7.
LEW Wires and cables	The London Electric Wire Co. & Smiths, Ltd., Playhouse Yard, Golden Lane, E.C.1.
LEWCOS Radio products	The London Electric Wire Co. & Smiths, Ltd., Playhouse Yard, Golden Lane, E.C.1.
LINAPEX Varnished cloths, silks and tapes ...	Ioco Rubber & Waterproofing Co., Ltd., Netherton Works, Anniesland, Glasgow, W.3.
LINK Clips for fixing metal sheathed house wires	W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1.
LINOLITE Reflector fittings for shop-window, cornice and picture lighting	A. W. Beuttell, Ltd., 96, Victoria St., S W.1.
LITHOLITE Moulded insulators	Litholite Insulators, Ltd., 55-57, Hackney Grove, London, E.8.
LITTLE GIANT Electric and pneumatic portable hand drills	The Consolidated Pneumatic Tool Co., Ltd., Egyptian House, 170, Piccadilly, W.1.
LIVERPOOL CABLES Wires and cables	The Liverpool Electric Cable Co., Ltd., Linacre Lane, Bootle, Liverpool.
L.K. House service meters, overhead line switchgear, lighting accessories	Elkay Electrical Mfg. Co., Ltd., 4, Southampton Row, W.C.1.
LOHYS Electrical sheets and stampings ...	Joseph Sankey & Sons, Ltd., Bilston, Staffs.
LORIVAL Insulating material	Lorival Mfg. Co. (1921), Ltd., Norwood Works, Southall, Middlesex.
L.P. Lamplock	G. S. Peckham & Co., 4-5, New Compton St., Charing Cross Rd., W.C.2.
L.P.S. Insulated varnished silk cambric, paper, tapes and sleevings, bakelite, &c.	L.P.S. Electrical Co., Ltd., Avenue Rd., Acton, W.3.
L.P.S. Magnet and resistance wires, cords and tungsten contacts	L.P.S. Electrical Co., Ltd., Avenue Rd., Acton, W.3.
L.P.S.-DUDLO Enamelled wire	L.P.S. Electrical Co., Ltd., Avenue Rd., Acton, W.3.
L.S.A. Batteries	Thompson & Co., 1 & 3, Old Swan Lane, E.C.4.
LUNDBERG Switches, plug connectors and kindred accessories	A. P. Lundberg & Sons, Ltd., Pioneer Electrical Works, Paradise Passage, Sheringham Rd., N.7.
LUX Storage batteries	Chloride Electrical Storage Co., Ltd., Clifton Junction, near Manchester.
LUX Dry gas fire extinguishing without damage	Walter Kidde & Co., Inc., 2, Victoria St., S.W.1.
LUXRAY Glassware lighting units	Downes & Davies, 1 & 3, Stanley St., Liverpool.
LYRIC Fittings wire	W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1.
M. & C. Open type switch and control gear, ironclad switch and control gear, flameproof switch and control gear	Mavor & Coulson, Ltd., 47, Broad St., Mile End, Glasgow.
MACINTOSH Paper and rubber insulated cables ...	Macintosh Cable Co., Ltd., St. James's House, St. James's St., S.W.1.

NAME AND DESCRIPTION.	MANUFACTURED BY OR OBTAINABLE FROM.
MACINTOSH Wiring systems	Macintosh Cable Co., Ltd., St. James's House, St. James's St., S.W.1.
MACONITE Insulated cables	Macintosh Cable Co., Ltd., St. James's House, St. James's St., S.W.1.
MACRORY Service box	Standard Telephones & Cables, Ltd., Connaught House, Aldwych, W.C.2.
MAGICLOG Electric log fires	Berry's Electric, Ltd., 85-6, Newman St., Oxford St., W.1.
MAGICOAL Electric fires	Berry's Electric, Ltd., 85-6, Newman St., Oxford St., W.1.
MAGNA V.i.r. cables and lead covered cables, &c.	Magna Wire & Cable Co., Ltd., 137, Victoria St., S.W.1.
MAGNASTART High starting torque S.C. motors ...	The Harland Engineering Co., "B.E.P." Works, Alloa, Scotland.
MAGNET Electric fans of every description ...	The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.
MAGNET Household electric appliances for heating, cooking, washing, cleaning, ironing, &c.	The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.
MAGNET Wiring systems for general and industrial purposes	The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.
MAGNET Conduits, fittings and accessories ..	The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.
MAGNUM Two-pin plug connectors	A. P. Lundberg & Sons, Ltd., Pioneer Electrical Works, Paradise Passage, Sheringham Rd., N.7.
MAJESTIC Wireless h.t. battery eliminator ...	The Benjamin Electric, Ltd., Brantwood Works, Tariff Rd., Tottenham, N.17.
MANSON Adhesive protecting tape	William Geipel, Ltd., Vulcan Works, 156-170, Bermondsey St., S.E.1.
MARCONI Various types of valves for reception and transmission, bright and dull emitter for both general and special purposes	M.O. Valve Co., Ltd., Osram Works, Brook Green, Hammersmith.
MARELLI Electric fans	Marelli & Co., Ltd., 19-20, Garlick Hill, E.C.
MARTINS A.P. double-pole porcelain fuses ...	W. C. Martin & Co., Ltd., 12, West Campbell St., Glasgow.
MARVEL Tumbler switches for variable control from two or more positions	A. P. Lundberg & Sons, Ltd., Pioneer Electrical Works, Paradise Passage, Sheringham Rd., N.7.
MASTA Ironclad fuse-switches	Berry's Electric, Ltd., 85-6, Newman St., Oxford St., W.1.
THE MASTER VALVE Wireless receiving, transmitting, rectifying and modulating valves	Mullard Radio Valve Co., Ltd., Nightingale Works, Nightingale Lane, S.W.2 (Manufacturers). Mullard Wireless Service Co., Ltd., Mullard House, Denmark St., W.C.2 (Distributors).
MAXEI Vacuum impregnating plant, coil and armature winding machines, transformer de-hydrating apparatus (vacuum and centrifugal)	Soc. Anon. Machines Auxiliares Pour l'Electricité & l'Industrie, 66, Victoria St., S.W.1.
MAXIGRAPH Chart recorders, maximum demand instruments, summation meters (kW and kVA)	Landis & Gyr, Ltd., Elgee Works, Victoria Rd., North Acton, W.3.
MAXIM Lamps	Poynter, Griffiths & Co., Ltd., Maxim Lamp Works, 75, Canonbury Rd., N.1.
MAXLUME Industrial and commercial lighting fittings and heating apparatus	Veritys, Ltd., Plume Works, Aston, Birmingham.
MAXTORQ Squirrel-cage type induction motors (single, two and three speed type)	Lancashire Dynamo & Motor Co., Ltd., Trafford Park, Manchester, associated with The Crypto Electrical Co., Ltd., Acton Lane, Willesden, London, N.W.10.
MAYTAG Electric clothes washer	Hotpoint Electric Appliance Co., Ltd., 24, Newman St., Oxford St., W.1.
M.C.L. & REPETITION Motor-car electrical equipment and automatic screw machine products	M.C.L. & Repetition, Ltd., Pool Lane, Langley, Birmingham.
M.E. Battery-charging switchboards ...	Mann, Egerton & Co., Ltd., Major's Corner, Ipswich.
M.E.C Small electric motors, a.c. and d.c.	The Medical Engineering Co., Ltd., Englefield Rd., N.1

NAME AND DESCRIPTION.	MANUFACTURED BY OR OBTAINABLE FROM.
MECVENT Organ-blowing equipments, forge blower, industrial fans, &c.	Millns Electrical Co., 17, Whitefriars St., E.C.4.
MEDIUM RESISTANCE Special high-quality dynamo sheets and stampings	Joseph Sankey & Sons, Ltd., Bilston, Staffs.
MEGGER Electrical instruments	Evershed & Vignoles, Ltd., Acton Lane Wks., London, W.4.
MEGGERLAC Grey enamel for insulating all classes of electrical windings where heat dissipation is desired	Pinchin, Johnson & Co., Ltd., General Bldgs., Aldwych, W.C.2.
MEGOHMOID Cable materials	Lindsay & Williams, Ltd., Bennett St. Works, Ardwick, Manchester.
MEMETTE Ironclad switches	Midland Electric Mfg. Co., Ltd., M.E.M. Works, Barford St., Birmingham.
MEMREX Ironclad switches	Midland Electric Mfg. Co., Ltd., M.E.M. Works, Barford St., Birmingham.
MEMSET Splitters (D.P. switch with 4 S.P. fuses)	Midland Elec. Mfg. Co., Ltd., Barford St., Birmingham.
MERSEY Dynamos and motors	McClure & Whitfield, Stockport.
MERSEY Motors	City Electrical Co., 1, Emerald St., W.C.1.
MET-VICK Electric appliances, wiring accessories and supplies of all kinds	Metro-Vick Supplies, Ltd., 155, Charing Cross Rd., W.C.2.
MET-VICK-RAY All metal shop window reflectors ...	Metro-Vick Supplies, Ltd., 155, Charing Cross Rd., W.C.2
METROHM Insulation tester	Everett, Edgcumbe & Co., Ltd., Colindale Works, Hendon, N.W.9.
MICANITE Insulating material	Mica & Micanite Supplies, Ltd., Offord St., N.1.
MICANITE Insulating sheet, tubes, washers, &c.	The Micanite & Insulators Co., Ltd., Empire Works, Blackhorse Lane, E.17.
MIDGET MASTA Fuse switch	Berry's Electric, Ltd., 85-6, Newman St., Oxford St., W.1
MILL Circuit breakers	Geo. Ellison, Perry Barr, Birmingham.
MINIMAX Bakelite side-entry cord-grip plugs ...	A. P. Lundberg & Sons, Ltd., Pioneer Electrical Works, 477-489, Liverpool Rd., Holloway, N.7.
MONEL Nickel alloy, anti-corrosive metal ...	G. & J. Weir, Ltd., Cathcart, Glasgow.
MOONSTONE Glassware	Underwood (Manchester), Ltd., 1, Dickinson St., Manchester.
MORCO Illuminating glassware, electrical accessories, heating apparatus	T. B. Morley & Co., Ltd., Jameson St., Hull, and Leeds.
MORGANITE Brushes	The Morgan Crucible Co., Ltd., Battersea Works, Church Rd., S.W.11.
MORGANITE Electric heaters	The Morgan Crucible Co., Ltd., Battersea Works, Church Rd., S.W.11.
MORTISE Single-way small narrow-panel tumbler switches	A. P. Lundberg & Sons, Ltd., Pioneer Electrical Works, Paradise Passage, Sheringham Rd., N.7.
MOSAIC Fires and paint removers	Girlings, Ltd., Electricity Works, Maldon, Essex.
MOULDENSITE Moulding powders and impregnating varnishes	Mouldensite, Ltd., Darley Dale, Derbyshire.
MOULDENSITE Moulding materials	Bakelite, Ltd., 68, Victoria St., S.W.1.
MUELLER Universal test clips	L.P.S. Electrical Co., Ltd., Avenue Rd., Acton, W.3.
MULPARVO A utility heater	Berry's Electric, Ltd., 85-6, Newman St., Oxford St., W.1
M.V. Wiring materials, accessories and electric apparatus of every description	Metro-Vick Supplies, Ltd., 155, Charing Cross Rd., W.C.2.
N Insulating tape	St. Helens Cable & Rubber Co., Ltd., Slough.
NALDERS Electrical measuring instruments and relays of all types	Nalder Bros. & Thompson, Ltd., 97a, Dalston Lane, E.8.
NARROW OBLONG Two-pin panel plug connectors ...	A. P. Lundberg & Sons, Ltd., Pioneer Electrical Works, Paradise Passage, Sheringham Rd., N.7.

NAME AND DESCRIPTION.	MANUFACTURED BY OR OBTAINABLE FROM.
N.B.D. Electrical plant	Newton Bros. (Derby), Ltd., Alfreton Rd., Derby.
N.C.S. Electrical measuring instruments and relays of all types	Nalder Bros. & Thompson, Ltd., 97a, Dalston Lane, E.8.
NECO Electric motors ½ to 1 h.p., a.c. and d.c.	Normand Electrical Co., Ltd., 3, North Side, Clapham Common, S.W.4.
NEPTUNE Bare wires of all descriptions, insulated wires, telegraph, telephone and submarine cables	W. F. Dennis & Co., 70, Queen Victoria St., E.C.4.
NESDRUM W.T. boilers	Richardsons, Westgarth & Co., Ltd., Hartlepool.
NEWBERRY Magicoal fires	Berry's Electric, Ltd., 85-6, Newman St., Oxford St., W.1.
NEWBRIDGE Time switches	Horstmann Gear Co., Ltd., Newbridge Works, Bath.
NEWTONS Dynamos, motors and train-lighting equipment	Newtons of Taunton, Taunton.
NICHRO Electric domestic irons	Cranmer & Cheshire, 9, Steward St., Spring Hill, Birmingham.
NICO Fittings, glassware and accessories ...	Nico Light Co., Ltd., 19, Farringdon Avenue, E.C.
NIPHAN Couplings and plugs for cables ...	Simmonds & Stokes, Ltd., 4, Vernon Place, Southampton Row, W.C.1.
NO-LAG Induction motors	British Thomson-Houston Co., Ltd., Rugby.
NOMET Special wiring system and fittings ..	W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1.
NOVEL Switch, 5-amp. tumbler type, fitted with extra terminal for looping ...	W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1.
OASIS Accumulator acid, acid-resisting paint	General Chemical & Pharmaceutical Co., Ltd., Willesden, N.W.10.
OHMALINE Insulating varnish	Griffiths Bros. & Co., London, Ltd., Macks Rd., S.E.16.
OHMER Insulating testing sets	Nalder Bros. & Thompson, Ltd., 97a, Dalston Lane, E.8.
OKONITE Insulating tape	William Geipel, Ltd., Vulcan Works, 156-170, Bermondsey St., S.E.1.
OLONITE Electric cables	The Greenwich Cable Works, Ltd., Crooms Hill, Greenwich, S.E.10.
OMEGA Vacuum electric lamps of all kinds	Omega Lampworks, Ltd., Rodney Place, Merton Abbey, S.W.19.
ONE-DER Loudspeaker	Edison Swan Electric Co., Ltd., 123-5, Queen Victoria St., E.C.4.
ORB Switchgear, ironclad	Geo. M'Cartney & Co., Burnside Works, Cumnock, N.B.
ORBIT Traversing desk bracket or cabin fan, for commercial or marine use	Veritys, Ltd., Plume Works, Aston, Birmingham.
ORION Vacuum cleaners and vacuum washers	Electrical Components, Ltd., 88-90, Gt. Charles St., Birmingham.
OSRAM Various types of valves for reception and transmission, bright and dull emitter for both general and special purposes	M.O. Valve Co., Ltd., Osram Works, Brook Green, Hammersmith.
OSRAM Electric lamps for all conditions of lighting	General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.
OSRAM Wireless valves of all types for general and special requirements	General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.
OWL Porcelain	Geo. Wade & Son, Ltd., Manchester Pottery, High St., Burslem, Staffs.
OZONAIR Ozone apparatus, pure air ventilation	Ozonair, Ltd., 96, Victoria St., S.W.1.
P. & G. Accumulators	Pritchett & Gold & E.P.S. Co., Ltd., 50, Grosvenor Gardens, S.W.1.
P. & R. Accumulators for cars and wireless	Peto & Radford, Props.: Pritchett & Gold & E.P.S. Co., Ltd., 50, Grosvenor Gardens, S.W.1.
PAKYDERM Finishing varnish	Griffiths Bros. & Co., London, Ltd., Macks Rd., S.E.16.
PARAGON Air pump	G. & J. Weir, Ltd., Cathcart, Glasgow.

NAME AND DESCRIPTION.	MANUFACTURED BY OR OBTAINABLE FROM.
PAXOLIN Varnished paper boards, insulators, tubes, &c.	The Micanite & Insulators Co., Ltd., Empire Works, Blackhorse Lane, Walthamstow, E.17.
PEERLESS Insulator and fibre	Attwater & Sons, Hopwood Street Mills Preston.
PEERLESS Single-phase repulsion induction motors, generators and fans	S. G. Leach & Co., Ltd., 26-30, Artillery Lane, E.1.
PEERLESS Insulation paper	J. Burns, Ltd., Wangye Works, Chadwell Heath, Essex.
PEERLESS Insulation	The Micanite & Insulators Co., Ltd., Empire Works, Blackhorse Lane, Walthamstow, E.17.
P.E.H. Heating apparatus	Premier Electric Heaters, Ltd., Keeley St., Watery Lane, Birmingham.
PELAPONE Country-house electric lighting plants	New Pelapone Engine Co., Ltd., 41, Baker St., W.
PERCO-WASH Electric clothes-washing device and washboiler	The Jackson Electric Stove Co., Ltd., 143, Sloane St., S.W.1.
PERNAX Electric cables	The Greenwich Cable Works, Ltd., Crooms Hill, Greenwich, S.E.10.
PERTINAX Impregnated paper (bakelite base) tubes and boards	Geo. L. Scott & Co., Ltd., 69, Fleet St., E.C.4.
PETROLEX Fire extinguishers for electrical equipment	Read & Campbell, Ltd., 75, Victoria St., Westminster, S.W.1.
PHENOLITE Laminated bakelite	J. Burns, Ltd., Wangye Works, Chadwell Heath, Essex.
PHLATTA Switches	The Edison Swan Electric Co., Ltd., 123-5, Queen Victoria St., E.C.4.
PHONOPORE Telephones for superimposing on telegraph lines	Sterling Telephone and Elec. Co., Ltd., Dagenham, Essex.
PINNACLE Switch fuses, enclosed fuses, &c. ...	Pinnacle Switchgear & Fuse Co., Weybridge, Surrey.
PIONEER Turn-type switches and switch plugs	A. P. Lundberg & Sons, Ltd., Pioneer Electrical Works, Paradise Passage, Sheringham Rd., N.7.
PIRELLI-GENERAL Wires, cables and flexibles	The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.
PIVOT Single and two-way tumbler switches	A. P. Lundberg & Sons, Ltd., Pioneer Electrical Works, Paradise Passage, Sheringham Rd., N.7.
PIVOT COMBINATION Tumbler switch and two-pin connector	A. P. Lundberg & Sons, Ltd., Pioneer Electrical Works, Paradise Passage, Sheringham Rd., N.7.
PIVOT INTERMEDIATE Tumbler switches for control of lamps from more than two positions	A. P. Lundberg & Sons, Ltd., Pioneer Electrical Works, Paradise Passage, Sheringham Rd., N.7.
PIXY Bell pushes with straight-line movement	A. P. Lundberg & Sons, Ltd., Pioneer Electrical Works, Paradise Passage, Sheringham Rd., N.7.
PLANIA Arc lamp carbons, carbon brushes, carbon battery plates, &c.	William Geipel, Ltd., Vulcan Works, 156-170, Bermondsey St., S.E.1.
P.M. VALVES Dull filament receiving valves ...	Mullard Wireless Service Co., Ltd., Mullard House, Denmark St., W.C.2 (Distributors). Mullard Radio Valve Co., Ltd., Nightingale Works, Nightingale Lane, S.W.12 (Manufacturers).
POINTOLITE Lamps	Edison Swan Electric Co., Ltd., 123-5, Queen Victoria St., E.C.4.
PRACHE Foundations for preventing vibrations	Fred. J. Down, 90-93, Fenchurch St., E.C.3.
PREMIER Fires	Premier Electric Heaters, Ltd., Keeley St., Watery Lane, Birmingham.
PREMIER Accumulators	Premier Accumulator Co. (1921), Ltd., Cattle Market Rd., Northampton.
PREMIER Electric vacuum cleaner	Hotpoint Electric Appliance Co., Ltd., 24, Newman St., Oxford St., W.1.
PREMIER DUPLEX Electric vacuum cleaner	Hotpoint Electric Appliance Co., Ltd., 24, Newman St., Oxford St., W.1.
PREMIER JUNIOR Electric vacuum cleaner	Hotpoint Electrical Appliance Co., Ltd., 24, Newman St., W.1.
PRENTO Distribution boards and switchgear	Electrical Accessories Mfg. Co., Progress Works, Low Hall Mills, Holbeck, Leeds.

NAME AND DESCRIPTION.	MANUFACTURED BY OR OBTAINABLE FROM.
PRESCOT Box compounds	British Insulated Cables, Ltd., Prescot, Lancs.
PRESCOT Feeder pillars	British Insulated Cables, Ltd., Prescot, Lancs.
PRESCOT Joint boxes	British Insulated Cables, Ltd., Prescot Lancs.
PRESCOT Overhead equipment for electric railways and tramways	British Insulated Cables, Ltd., Prescot, Lancs.
PRESCOT Paper-insulated cables	British Insulated Cables, Ltd., Prescot, Lancs.
PRESCOT Cotton-covered wires	British Insulated Cables, Ltd., Prescot Lancs.
PRESTO Single and two-way pendant switches	A. P. Lundberg & Sons, Ltd., Pioneer Electrical Works, 477-489, Liverpool Rd., Holloway, N.7.
PRISMATIC Bulkhead fitting	Berry's Electric, Ltd., 85-6, Newman St., Oxford St., W.1.
PROMETHEUS Electric irons, radiators, water heaters, &c.	Dowsing Radiant Heat Co., Ltd., Bollo Lane, Acton, W.3, and 91-3, Baker St., W.1.
PUL-SYN-ETIC Electric impulse clocks and time discipline apparatus	Gent & Co., Ltd., Faraday Works, Leicester.
QUASI-ARC Electric welding plants and electrodes	Quasi-Arc Co., Ltd., 15, Grosvenor Gardens, S.W.1.
QUEAD Electric fires and cookers	William Geipel, Ltd., Vulcan Works, 156-170, Bermondsey St., S.E.1.
QUICKWAY Coil-winding and forming machinery	Midland Dynamo Co., Ltd., 64, Belgrave Gate, Leicester.
RADIODESCENT Appliances for radiant heat treatment	Dowsing Radiant Heat Co., Ltd., Bollo Lane, Acton, W.3, and 91-3, Baker St., W.1.
RADIOMATIC Broadcast receivers	Gent & Co., Ltd., Faraday Works, Leicester.
RADION Insulating material	American Hard Rubber Co. (Britain), Ltd., 13a, Fore St., E.C.2.
RECORD Insulation testers, battery cut-outs, circuit breakers	Record Electrical Co., Ltd., Broadheath, Altrincham, Cheshire.
REDMANOL Moulding materials	Bakelite, Ltd., 68, Victoria St., S.W.1.
REESILEO Oils, insulating and lubricating ...	Reesoils, Ltd., 1, Eldon Sq., Newcastle-on-Tyne.
REFLEX Control of pendulums of existing workmen's recorders and other pendulums	Gent & Co., Ltd., Faraday Works, Leicester.
REGAL Ebonite	Spicers, Ltd., 19, New Bridge St., E.C.4.
RELAY Automatic telephone and calling installations	Relay Automatic Telephone Co., Ltd., Marconi House, Strand, W.C.2.
RELIANCE Circuit breakers	Whipp & Bourne, Castleton, Manchester.
REMY Permanent tungsten steel magnets and magnet steel	W. F. Dennis & Co., 70, Queen Victoria St., E.C.4.
REPELLITE Insulating sheets	Spicers, Ltd., 19, New Bridge St., E.C.4.
RESILIA Pyrometers, electrical high precision instruments, miniature electrical instruments	Foster Instrument Co., Letchworth, Herts.
RESISTON Insulating material	American Hard Rubber Co. (Britain), Ltd., 13a, Fore St., E.C.2.
RESTFULITE Electric standards	Berry's Electric, Ltd., 85-6, Newman St., Oxford St., W.1.
REVELATION Guaranteed lamps, flashing adaptors, heaters, &c.	Electroservice, Ltd., 3, Waterloo Rd., S.E.1.
REVERSING Tumbler switch, with or without "off" position	A. P. Lundberg & Sons, Ltd., Pioneer Electrical Works, Paradise Passage, Sheringham Rd., N.7.
REX A.c. meters	Thompson & Co., 1 & 3, Old Swan Lane, E.C.4.
RHECO Switchboards and switchgear fittings, ceiling dustproof fittings, cast iron, weatherproof	Robinson & Hands Elecl. Co., Ltd., Barwick St., Birmingham.
R.L.M. One-piece reflector fitting	Benjamin Electric, Ltd., Brantwood Works, Tariff Rd., N.17.

NAME AND DESCRIPTION.	MANUFACTURED BY OR OBTAINABLE FROM.
RODALUX Street-lighting reflector fitting ...	Benjamin Electric, Ltd., Brantwood Works, Tariff Rd., N.17.
ROYAL EDISWAN Lamps	Edison Swan Electric Co., Ltd., 123-5, Queen Victoria St., E.C.4.
RUPTOR Ironclad switch	W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1.
RUTTER Patent wood pole for overhead transmission	Gabriel Wade & English, Ltd., Hull.
SADIA Automatic water heater	Sadia, Ltd., 22, Newman St., W.1.
SAFETEE Switches	L. Weekes (Luton), Ltd., Langley St., Luton, Beds.
SAFUSE Fuses and combined switch fuse and interlocked switch plugs	Donovan & Co., 47, Cornwall St., Birmingham.
ST. HELENS Cab tire sheathed (C.T.S.) cables, dialite cables	St. Helens Cable & Rubber Co., Ltd., Slough.
ST. HELENS Ebonite, corrosion-proof fittings ...	St. Helens Cable & Rubber Co., Ltd., Slough.
ST. HELENS Insulating matting, insulating gloves, insulating shoes	St. Helens Cable & Rubber Co., Ltd., Slough.
SALFORD Circuit breakers	General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.
SANGAMO-EDISWAN Meters	Edison Swan Electric Co., Ltd., 123-5, Queen Victoria St., E.C.4.
SANTON Switching plugs, geysers, wash boilers, &c.	Santon, Ltd., Dock St., Newport, Mon.
SATCHWELL Thermostat for electrically heated rooms, water heaters, ovens, &c.	The Rheostatic Co., Ltd., Mackenzie St., Slough, Bucks.
SAUTER Time switches and thermostats ...	Nathan & Allen, Ltd., 25, Victoria St., London, S.W.1.
SAVELITE Opal a.c. incandescent lamp	Philips Lamps, Ltd., 145, Charing Cross Rd., W.C.2.
S & C Turned and screwed repetition parts from bar in brass and steel, capstan and auto productions and pressings from sheet	Spears & Company, Capstan Repetition Works, 68, Park Rd., Hockley, Birmingham.
SCHERBIUS Phase advancers and a.c. motor speed regulators	British Brown Boveri, Ltd., Trafalgar House, Waterloo Place, S.W.1.
SCRULIX Guy anchors for staying poles, &c.	F. J. Down, 90-3, Fenchurch St., E.C.3.
SECTOR Accessories, fires, irons	Electrical Components, Ltd., 88-90, Gt. Charles St., Birmingham.
SEELCO Wiring system comprising lead-alloy sheathed wires and simple accessories	Siemens Elec. Lamps & Supplies, Ltd., 38 & 39, Upper Thames St., E.C.4.
SELCO Syrens, motors, fans	S. G. Leach & Co., Ltd., 26-30, Artillery Lane, E.1.
SELZ Lamp shades	Charles Selz, 47, New Cavendish St., W.1.
SEMAPHITE Cables	Johnson & Phillips, Ltd., Charlton, S.E.
SERIES-PARALLEL Tumbler switch with or without "off" position	A. P. Lundberg & Sons, Ltd., Pioneer Electrical Works, Paradise Passage, Sheringham Rd., N.7.
SERVICE Unbreakable grid resistances, domestic electrical appliances	The Rheostatic Co., Ltd., Mackenzie St., Slough.
SHAYDOLITE Lamp lacquer	Griffiths Bros. & Co., London, Ltd., Macks Rd., S.E.16.
SHIPTON Automatic telephone systems	Shipton Automatic Telephone System, Ltd., Caxton House Tothill St., S.W.1.
SIEMENS Electric lamps	Siemens Elec. Lamps & Supplies, Ltd., 38 & 39, Upper Thames St., E.C.4.
SIEMENS Electric pyrometers and distance thermometers	Siemens Bros. & Co., Ltd., Woolwich, S.E.18.
SIEMENS Batteries—fluid and dry	Siemens Bros. & Co., Ltd., Woolwich, S.E.18.
SIEMENS Ebonite	Siemens Bros. & Co., Ltd., Woolwich, S.E.18.
SIEMENS Joint boxes, feeder pillars, house service fuse boxes	Siemens Bros. & Co., Ltd., Woolwich, S.E.18.

NAME AND DESCRIPTION.	MANUFACTURED BY OR OBTAINABLE FROM.
SIEMENS Electric cables and wires of all types	Siemens Bros. & Co., Ltd., Woolwich, S.E.18.
SIFAM Electrical and radio measuring instruments and instrument transformers	Sifam Electric Instrument Co., Ltd., Bush House, Aldwych, W.C.2.
SILUMINITE Switchboards, mouldings, &c. ...	Siluminite Insulator Co., Ltd., Erith, Kent.
SILVALUX Electric lamps (opal)	Siemens Elec. Lamps & Supplies, Ltd., 38 & 39, Upper Thames St., E.C.4.
SILVARAY One-piece glassware fittings	Siemens Elec. Lamps & Supplies, Ltd., 38 & 39, Upper Thames St., E.C.4.
SILVERSTONE Decorative glassware, shades, bowls and enclosed lighting units	Metro-Vick Supplies, Ltd., 155, Charing Cross Rd., W.C.2.
SILVERTOWN Cables, instruments, &c.	India Rubber, Gutta Percha & Telegraph Works Co., Ltd., 106, Cannon St., E.C.4.
SIMBAKE Switches, holders and accessories ...	Simpson, Baker & Co., 2-5, Nelson St., Bristol.
SIMPLEX Jacks	Equipment & Engineering Co., 2 & 3, Norfolk St., W.C.2.
SIMPLEX Conduits and all electric installation equipment	Simplex Conduits, Ltd., Garrison Lane, Birmingham.
SIMPLEX "Ordinary" and "Reverse" door contacts	A. P. Lundberg & Sons, Ltd., Pioneer Electrical Works, Paradise Passage, Sheringham Rd., N.7.
SINDANYO Insulating and arc-resisting boards	Turner Bros. Asbestos Co., Ltd., Rochdale.
SINEW Wireless terminals	Clarkes, Sinew Works, Redditch.
SISSON Enclosed self-lubricating steam engines	W. Sisson & Co., Ltd., Elmbridge Rd., Gloucester.
SISTOFLEX Insulating sleeving, fibre and leatheroid	Spicers, Ltd., 19, New Bridge St., E.C.4.
SISTOFLEX Varnished cloth, paper, tapes, &c ...	Spicers, Ltd., 19, New Bridge St., E.C.4.
SLOTTED STEEL Pierced steel angles, channels, flats, &c.	Constructors, Ltd., Imperial House, Charlotte St., Birmingham.
SMOOTHWELL Irons	Premier Electric Heaters, Ltd., Keeley St., Watery Lane, Birmingham.
SOLARIUM Electric sun baths	Dowsing Radiant Heat Co., Ltd., Bollo Lane, Acton, W.3, and 91-3, Baker St., W.1.
SOLBIT Solid bitumen mining cables	W. T. Glover & Co., Ltd., Trafford Park Manchester.
SOTONITE Insulated cables	Pirelli-General Cable Works, Ltd., Southampton and Eastleigh.
SOVEREIGN Dry cells	Atlas Carbon & Battery Co., Ltd., 56, Southwark Bridge Rd., S.E.1.
S.P. Shortpath wireless valves, blue spot, green spot and red spot	Metro-Vick Supplies, Ltd., 155, Charing Cross Rd., W.C.2.
SPECIAL LOHYS Electrical sheets and stampings ...	Joseph Sankey & Sons, Ltd., Bilston, Staffs.
SPIROGLIDE Turbine pump	Harland Engineering Co., Ltd., B.E.P. Works, Alloa, Scotland.
SPLENDOR Electric lamp manufacturers	M.S.L., Ltd., Splendor House, 67, Hammersmith Rd., W.14.
SPRING HAMMER For drilling stone, brickwork, &c. ...	Fred. J. Down, 90-93, Fenchurch St., E.C.3.
STALLOY Transformer sheets, stampings of all shapes, telephone and loud-speaker diaphragms	Joseph Sankey & Sons, Ltd., Bilston, Staffs.
STANDARD Vacuum sweepers, washing and ironing machines	Standard Telephones & Cables, Ltd., Connaught House, Aldwych, W.C.2.
STANDARD Cables of all types	Standard Telephones & Cables, Ltd., Connaught House, Aldwych, W.C.2.
STANDARD Public address systems	Standard Telephones & Cables, Ltd., Connaught House, Aldwych, W.C.2.
STANDARD Telephones for all purposes, manual and automatic	Standard Telephones & Cables, Ltd. Connaught House, Aldwych, W.C.2.

NAME AND DESCRIPTION.	MANUFACTURED BY OR OBTAINABLE FROM.
STANDARD Traffic control system	Standard Telephones & Cables, Ltd., Connaught House, Aldwych, W.C.2.
STANDARD Wireless transmitting and receiving apparatus	Standard Telephones & Cables, Ltd. Connaught House, Aldwych, W.C.2.
STANNOS WIRING SYSTEM V.I.R. wires protected by a water tight tinned copper sheathing suitable for concentric or two-wire installation	Siemens Bros. & Co., Ltd., Woolwich, S.E.18.
STELLA Conduits and conduit fittings	Stella Conduit Co., Ltd., Highfield Works, Bilston, Staffs.
STERLING Insulating varnishes, solid impregnating compounds, wire enamels	The Sterling Varnish Co., 196, Deansgate, Manchester.
STERLING Telephone systems and equipment ...	Sterling Telephone & Elec. Co., Ltd., Dagenham, Essex.
STERLING Mine phones and signalling apparatus	The Marconiphone Co., Ltd., 210-212, Tottenham Court Rd., W.1. (Sole Agents for Sterling Telephone & Electric Co., Ltd.)
STERLING Telephones and kindred apparatus ...	The Marconiphone Co., Ltd., 210-212, Tottenham Court Rd., W.1. (Sole Agents for Sterling Telephone & Electric Co., Ltd.)
STROWGER Public automatic telephones and exchange equipment, private automatic exchanges	Automatic Telephone Manufacturing Co., Ltd., Strowger Works, Milton Road, Edge Lane, Liverpool.
SUDDEUTSCHE Cable and flexible	"Z" Electric Lamp & Supplies Co., Ltd., 73, Newman St., W.1.
SUNBEAM Magicoal fire	Berry's Electric, Ltd., 85-6, Newman St., Oxford St., W.1.
SUNBLAZE Magicoal fire	Berry's Electric, Ltd., 85-6, Newman St., Oxford St., W.1.
SUNRAY Radiators	British Electric Transformer Co., Ltd., Wellington House, 125-130, Strand, W.C.2.
SUPASTONE Illuminating lighting glassware ...	Wholesale Fittings Co., Ltd., 23-27, Commercial St., E.1.
SUPER-BOX House-wiring joint box	W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1.
SUPER DREADNOUGHT Fuse switch	Berry's Electric, Ltd., 85-6, Newman St., Oxford St., W.1.
SUPERLUX Glassware	The General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.
SUPERSCALE Indicating instruments	Everett Edgcumbe & Co., Colindale Works, Hendon, N.W.9.
SUPER SEASONED Vulcanised fibre	J. Burns, Ltd., Wangye Works, Chadwell Heath, Essex.
SUPRONIC Cupro nickel high resistance wire ...	L.P.S. Electrical Co., Ltd., Avenue Rd., Acton, W.3.
SWAN BRAND Electrical cooking utensils with improved safety device	Mayall & Co., Ltd., 61, Moor St., Birmingham.
SWANLITE Industrial lighting fittings	The Edison Swan Electric Co., Ltd., 123-5, Queen Victoria St., E.C.4.
SYNCHRONOME Electric clocks	Synchronome Co., Ltd., 32-4, Clerkenwell Rd., E.C.1.
TANGENT Sound signals, ironcased and woodcased, and RADIO apparatus	Gent & Co., Ltd., Faraday Works, Leicester.
TATE Electric stop motion (safety device for engines)	James Tate & Co., Victory Works, Bradford.
TAYLOR-SCOTSON Pressure regulator	Cox-Walker & Partners, Darlington.
T.C.C. Mansbridge condensers, mica condensers, power factor improvement condensers	Telegraph Condenser Co., Ltd., Wales Farm Rd., North Acton, W.3.
TELAC Tumbler switches, accessories, switchgear, ironclad gear	J. H. Tucker & Co., Ltd., King's Rd., Tyseley, Birmingham.
TELENDURON Insulators for telegraph and telephone lines, also insulation mouldings for electrical trade	Thos. De la Rue & Co., Ltd., Shernhall St., Walthamstow, E.17.
TELETYPE Printing telegraph apparatus, &c. ...	Standard Telephones & Cables, Ltd., Connaught House, Aldwych, W.C.2.
TERRA-GRIP Continuity wiring system	Simplex Conduits, Ltd., Garrison Lane, Birmingham.

NAME AND DESCRIPTION.	MANUFACTURED BY OR OBTAINABLE FROM.
TERRAPIN Two-pin and "earth" plug connectors	A. P. Lundberg & Sons, Ltd., Pioneer Electrical Works, Paradise Passage, Sheringham Rd., N.7.
TEST SHEATH Test conductor for underground electric cables	W. T. Glover & Co., Ltd., Trafford Park, Manchester.
THERMOID Flexible cord	W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1.
THISTLE Conduit tubes and fittings	James McDougall, Ltd., Wednesbury, Staffs.
THREE STAR Accumulators	Three Star Accumulators, Ltd., Rosebery Avenue, N.17.
TIP-TOP Push-button switch for motor horns	Benjamin Electric, Ltd., Brantwood Works, Tariff Rd., N.17.
TIRRILL Automatic voltage regulators	British Thomson-Houston Co., Ltd., Rugby.
TREVA Electrical accessories	Trevelyans (B'ham), Ltd., 155, Bracebridge St., Birmingham
TRICITY Cookers	British Electric Transformer Co., Ltd., Hayes, Middlesex.
TRICITY Cookers and tableware	British Electric Transformer Co., Ltd., Wellington House, 125-130, Strand, W.C.2.
TRIPIN Three-pin plug connector (all current-carrying pins)	A. P. Lundberg & Sons, Ltd., Pioneer Electrical Works, Paradise Passage, Sheringham Rd., N.7.
TRIUMPH Fuses, ironclad fuse gear, "Castle" plugs and sockets	Castle Fuse & Engineering Co., Ltd., 33, Chester St., Liverpool.
TROJAN Electric irons, electric lamps and electric kettles	John Shaw & Sons (Wolverhampton) Ltd., Wolverhampton.
TUCKER Tumbler switches, accessories, switchgear, ironclad gear	J. H. Tucker & Co., Ltd., King's Rd., Tyseley, Birmingham
TUDOR Batteries	Tudor Accumulator Co., Ltd., Norfolk Street, W.C.2.
TUFNOL Synthetic resin paper insulation ...	George Ellison, Perry Barr, Birmingham.
TUNGSRAM Lamps	Tungsram Electric Lamp Works, Ltd., Commerce House, 72, Oxford St., W.1.
TUNGSTALITE Electric lamps, accumulators and batteries, crystals (wireless)	Tungstalite, Ltd., 47, Farringdon Rd., E.C.1.
TURBAX Fabric Bakelite for electrical purposes and mechanical gearing	Dacier, Ltd., 15-16, Jewry Street, E.C.3.
TURRET Multiple-way two-pin plug connector (3 to 6 ways)	A. P. Lundberg & Sons, Ltd., Pioneer Electrical Works, Paradise Passage, Sheringham Rd., N.7.
TWINOB Tumbler switch (either, both or "off"), also a.c. motor control and switch plug	A. P. Lundberg & Sons, Ltd., Pioneer Electrical Works, Paradise Passage, Sheringham Rd., N.7.
TYPERLITE Lighting standard for typewriters and office machines	Electricity Services, Ltd., 27, Martin Lane, Cannon St., E.C.4
ULTRADESCENT Appliances for ultra-violet ray (artificial sunlight) treatment combined with radiant heat	Dowsing Radiant Heat Co., Ltd., Bollo Lane, Acton, W.3, and 91-93, Baker Street, W.1.
UNITEM "Two-service" adaptor, B.C., 2-pin (adjustable)	A. P. Lundberg & Sons, Ltd., Pioneer Electrical Works, Paradise Passage, Sheringham Rd., N.7.
UNIVERSAL Two-pin plug connectors and switch plugs	A. P. Lundberg & Sons, Ltd., Pioneer Electrical Works, Paradise Passage, Sheringham Rd., N.7.
UNIVERSAL House-wiring joint box	W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1.
UNIVERSAL Electric floor polisher	L. G. Hawkins & Co., Ltd., 30-35, Drury Lane, Kingsway, W.C.2.
U-SEAL Corrosion-proof fittings	St. Helens Cable & Rubber Co., Ltd., Slough.
UVRAL Ultra-violet ray (artificial sunlight) apparatus	Bower Electric (1926), Ltd., 27, Ridinghouse St., Gt. Portland St., W.1.
VAC-TRIC Vacuum cleaners, handle and cylinder models	Vac-Tric, Ltd., Broadway Works, Cricklewood, N.W.2.
VANDUARA Insulating tapes	John MacLennan & Co., 115, Newgate St., E.C.1.
VAN RADEN Accumulators	Van Raden & Co., Ltd., Great Heath, Coventry.
VEETA Flat switches, quick make and break	The General Accessories Co., Ltd., "Genex" House, 18-22, Euston Buildings, N.W.1.

NAME AND DESCRIPTION.	MANUFACTURED BY OR OBTAINABLE FROM.
VENAUTO Radio time switch	Venner Time Switches, Ltd., 45, Horseferry Rd., S.W.1.
VENNER Time switch, thermostats, and stop watch	Venner Time Switches, Ltd., 45, Horseferry Rd., S.W.1.
VENOFF Photographic and sunray time switches	Venner Time Switches, Ltd., 45, Horseferry Rd., S.W.1.
VENTEX Air filter	Ozonair, Ltd., 96, Victoria St., S.W.1.
VIDAL Portable electric drills and grinders	Vidal Engineering Co., Ltd., Thornton Rd., Croydon, Surrey.
VIKING Fuse switch	Berry's Electric, Ltd., 85-6, Newman St., Oxford St., W.1.
VINCENT Switch fuse	Vincent Switchgear Mfg. Co., Ltd., Sampson Rd. North, Birmingham.
VIRCLAD Cables	Electric Cables, Ltd., 88, Golden Lane, E.C.1.
VIRITE Electric cable, compound insulation for particularly severe conditions	Edison Swan Cables, Ltd., Lydbrook, Glos.
VISCO Air filter	Visco Engineering Co., Ltd., 162, Grosvenor Rd., S.W.1.
VOLTA Vacuum cleaners — domestic and industrial	Volta, Ltd., Kern House, 36-38, Kingsway, W.C.2.
VULMOS Vulcanised fibre and leatheroid ...	Mosses & Mitchell, Ltd., 122-124, Golden Lane, E.C.1.
WALSALL Steel conduits and fittings	Walsall Hardware Mfg. Co., Ltd., Ablewell St., Walsall.
WARD LEONARD Resistances, dimmers and rheostats	William Geipel, Ltd., Vulcan Works, 156-170, Bermondsey St., S.E.1.
WARWICK Lampholders and fittings, switch and fuse gear	William McGeoch & Co., Ltd., Warwick Works, 46, Coventry Rd., Birmingham.
"W.E." All classes of conduit fittings ...	Bernard & Co., 9, Horseferry Rd., S.W.1.
WEEKES Fuses	L. Weekes (Luton), Ltd., Langley St., Luton, Beds.
WELDRICS GRADE A Electrodes for welding	Weldrics (1922), Ltd., Station Road, Beeston, Notts.
WELLS Waste oil filters	A. C. Wells & Co., Ltd., 75, Victoria St., S.W.1.
WEMBLEY Street-lighting lanterns	The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.
WESTMINSTER Carbon brush holders, arc lamps (photo and medical), electric welders (Thomson process)	Westminster Engineering Co., Victoria Rd., N.W.10.
WESTON Electrical measuring instruments, instruments for radio service, high frequency thermo instruments	Weston Elecl. Instrument Co., Ltd., 15, Gt. Saffron Hill, E.C.1.
WESTOOL Electric drills and grinders	Westminster Tool & Electric Co., Ltd., Westool Works, 116, Putney Bridge Road, S.W.15.
WILD BARFIELD Furnaces and muffles	Automatic & Electric Furnaces, Ltd., Elecfurn Works, North Rd., Holloway, N.7.
WILMIL Malleable aluminium castings ...	Wm. Mills, Ltd., Grove St., Birmingham.
WITTON Electric motors for domestic and industrial uses	The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.
WITTONITE Insulating mouldings	The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.
WOLF Electric tools	S. Wolf & Co., Ltd., 115, Southwark St., S.E.1.
WORK METER Recording instrument for output and idle time of machinery	Lewenz & Wilkinson, Ltd., 25, Victoria St., S.W.1.
WYLEX Switch plugs	Geo. H. Scholes & Co., Ltd., Blantyre St., Hulme, Manchester.
XCEL Electric domestic appliances	Automatic Telephone Mfg. Co., Ltd., Strowger Works, Milton Rd., Edge Lane, Liverpool.
XCEL Electric domestic appliances	Siemens Elec. Lamps & Supplies, Ltd., 38 & 39, Upper Thames St., E.C.4.
XCEL Heating and cooking appliances ..	Downes & Davies, 1 & 3, Stanley St., Liverpool.

NAME AND DESCRIPTION.	MANUFACTURED BY OR OBTAINABLE FROM.
Z Wiring supplies	"Z" Electric Lamp & Supplies Co., Ltd., 73, Newman St., W.1.
ZED Fuses	Siemens Elec. Lamps & Supplies, Ltd., 38 & 39, Upper Thames St., E.C.4.
ZENAL Non-heating fuse element	Parmiter, Hope & Sugden, Ltd., Fluvent Electrical Works, Vernon St., Longsight, Manchester.
ZENITE Resistance units	Zenith Electric Co., Ltd., Zenith Works, Villiers Rd., N.W.2.
ZENITH Transformers, resistances, meter-testing equipment, &c.	Zenith Electric Co., Ltd., Zenith Works, Villiers Rd., N.W.2.
Z.I.R. Rust-proof conduit and fittings ...	Simplex Conduits, Ltd., Garrison Lane, Birmingham.

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A preliminary forecast should first be prepared and the figures should then be revised if necessary in accordance with production possibilities. It must be appreciated that for each line of merchandise there is a limit below which it is not economical to produce. Conversely the sales estimate may call for so large a volume of production of a particular type, that the extra expense involved would make the business unprofitable. Steps should be taken, therefore, to influence the sales figure, so as to obtain a well balanced production programme. Consideration must be given to the possibility of altering the emphasis of the sales programme by advertising or salesman efforts. If this is not possible, it may be advisable to purchase the sales requirements in a minor line from outside manufacturers, or even to drop the particular line in question if sales are not expected to improve, and if the deletion of the line would not affect the rest of the business. Steps should be taken to contract-out part of the work where requirements are expected to exceed production capacity, or alternatively, if the increased sales demand is likely to be permanent, arrangements can be made to purchase additional plant. But whatever the means that are adopted, the end of this revision of the sales estimate should be to establish a well balanced sales budget which is both possible and profitable from the viewpoint of the factory and of the sales department.

Factory Requirements.

The next step is to determine from this revised sales budget an estimate of factory requirements for the budget period. To this end the estimate should be converted to a quantitative basis, or failing this, the anticipated gross profits should be eliminated to give figures in shop cost values. From these estimated figures the works manager can then calculate the total required output for the period by taking into consideration the actual opening and desired closing inventories. The factory requirements for the period will be equal to the sales estimate, plus the required inventory at the close of the period, minus the estimated inventory at the beginning of the period. Needless to say, all quantities in the equation must be on the same basis, since it would be fatal to figure one item at selling price and another at shop cost.

But it is not enough to have an estimate of the quantity of goods that will have to be prepared over the budget period. The goods have not merely to be manufactured during the period; they must be manufactured and put into stock in advance of the receipt of a customer's order. At the same time, however, it would be uneconomical to manufacture the whole of the requirements within the first few weeks of the budget period. Not only would the capital cost of carrying the large inventory be unduly heavy, but from the point of view of economical production, the work must be distributed throughout the year so as to keep the machinery and equipment in steady operation and provide regular employment for the labour force. It is necessary, therefore, to co-ordinate sales and production throughout the period by planning production to prevent an excess of inventory, and yet provide a sufficient volume of goods on hand at all times to meet sales demands. This implies the setting up of an inventory of finished goods, and a production schedule to maintain that inventory.

The Production and Stock Schedule.

The sales estimate will have been made for a period ranging from three months to a year or more. This budget period, however, must be split up into smaller production periods corresponding to the normal time from the placing of an average sized order to the delivery into stock of the finished goods called for by the order. Depending upon the seasonal nature of the business, the total sales figure should be split up into smaller totals representing the probable sales during the various production periods. Records of previous years should prove of assistance in this respect.

The stock on hand at the beginning of each period must obviously be at least sufficient to cover the probable sales for that period. If it were possible to arrive at an exact forecast of sales, it would then be sufficient to manufacture in each production period just sufficient goods to meet the sales of the subsequent period. This ideal state of affairs would imply the greatest economy in stock investment; but in practice it is not possible to forecast sales exactly. Additional stock must therefore be carried to provide a margin of safety. Depending on the degree of confidence imposed in the estimates, this safety factor will vary from, say, 10 to 25 per cent. of the probable sales in each production period, and added to the anticipated sales for the period it would give the minimum inventory for the beginning of the period. Then when the minimum stock requirements have thus been established, the quantities to order during each production period can be determined from the equation

Probable sales for period, plus
Required stock at end of period, minus
Required stock at beginning of period, equals
Quantity to order for manufacturing during the period.

This system, by closely co-ordinating sales and production would result in the maximum economy in merchandise investment, but there are certain cases where it may be desirable to depart somewhat from the general procedure. For instance, there may be certain slow moving items of which only a limited quantity is sold during each production period. In such a case, the small shop orders would involve a relatively high production cost which must be balanced against the cost of carrying a larger inventory. This difficulty is usually surmounted by setting up a minimum "economical order" for each line, and where the required production for any period is less than this economical order, the larger volume is ordered and the excess put into stock to cover future sales.

The scheme may also be modified in the case of an industry with an exceptionally heavy seasonal peak. In such as the radio industry, where sales are not spread equally throughout the year, it may be advisable to adopt a steady manufacturing programme and build up in slack periods a stock to be depleted in the busy months. A decision on this point can only be made after careful consideration of the cost of carrying the larger inventory including the danger of obsolescence, and then comparing with this cost the advantage of regular over irregular production. But, whether it be determined to co-ordinate sales and production or to equalise production and build up stock during slack months, in either case the principles of the production budget can be very profitably employed in planning plant, material, and labour requirements over the period.

Electric Light as a Moth Destroyer.

Interesting experiments have been made lately by Mr. Robinson, one of the professors of the Entomological Institute in Alabama, Switzerland. Finding that from 30 to 50 per cent. of the tomato crops in a certain district of the State were ruined by grubs at the centre of the fruit, he had the happy thought of seeing whether the moths, laying the eggs from which these larvæ were hatched, could be destroyed by electricity. He installed eight electric lamps, varying from 80 to 200 watts, about three feet from the ground. The lamps were furnished with reflectors directed towards the soil, and underneath the lamps were placed basins filled with water on the top of which was poured a little petrol. The plan proved highly successful; the moths, attracted and bewildered by the lights, were drowned by thousands in the bowls beneath the lamps, and as the result 80 acres of tomatoes yielded perfect fruit, while neighbouring lots of land not so protected, lost from 30 to 60 per cent. of their crop. The same method has been tried with equal success in connection with melon-culture, and the fruit has been absolutely free from worms and graded as perfect.

Overhead Line Design.

The author bases line calculations on his claim that, within limits, for standard wood poles, the maximum permissible force at a point 2 ft. from the pole top is constant and independent of the pole height.

By J. A. SUMNER.

(*Concluded from page* 473.)

Example 1.—A three-phase, 3-wire 11,000-volt line; conductors $3 \times 3/.147$; continuous steel earth wire 7/14 s.w.g. 45-ton steel; triangular formation; E = 1.5 ft.; F = 1.5 ft.

It is required to find a suitable pole size and the span to be used, so that the components have maximum stress under worst conditions.

Full Method.

(*a*) The total wind pressure per span = .66 × diameter *in inches* of each ice-covered wire × number of wires $\times L = .66 \times L \times n \times d''$.

(*b*) The point at which the total force acts near pole top = $[(w_2 + w_3)F + w_4(E + F)] / (w_4 + w_2 + w_3)$ = "*a*" ft. from top.

(*c*) The wind pressure on the pole = $h \times$ wind pressure × average pole diameter *in inches* = $.66\ hP_d$.

(*d*) The point of action on pole of (*c*) = $[(D_g + 2D_t)/(D_g + D_t)]h/3 = h^1$; where D_g = pole diameter at the ground and D_t = pole diameter at the top.

Therefore the total wind pressure on the pole and wires, acting at 1 ft. from ground, produces a bending moment

$= [.66\ Lnd''\ (h - a) + (.66\ hP_d \times h^1)] \times 3.5$ lb. ft.

This leaves us with the unknown factors of pole diameter, height and span length. Standard values for the pole dimensions and assumed values of span must now be substituted for the unknowns in the equation, and the result compared with the maximum bending moment for the pole chosen. It will be seen that there are a great number of combinations of the possible values which may be given to the *independent variables*, and the following method has been used and is advanced by the writer as providing considerable simplification.

Short Method.

(See fig. 1, p. 471, for curve to give spans.)

(*a*) Wind pressure per foot run of span of all wires = W.

(*b*) Maximum span length $L = k/W$ (where k is a constant for given class of pole).

(*c*) Dip in conductor for span $L = L^2 r/8s$ (under worst conditions).

(*d*) Overall pole height = H (see fig. 2*a*, p. 472).

Examples.

Example 2.—Three-phase, 6,600-volt line with continuous earth wire; conductors $3 \times 3/.147 + 1 \times 7/14$ s.w.g. 45-ton steel wire. $W = 3 \times .712 + .66$ lb. = 2.796 lb. per foot.

Reference to fig. 1 shows permissible spans (for single poles) of 79, 158 and 316 ft. for *l*, *m* and *h* poles, respectively, or (for light A poles) a span of 395 ft. The choice, depending on local conditions, would therefore probably be between a heavy single pole at 316 ft. span and a light A pole at 395 ft. span. Choosing the former, it will be seen that a conductor dip of 7.6 ft. is required to allow for gale conditions on the ice-covered conductor. Hence $h = 20 + 7.6 + 2 = 29.6 = .86H$; $\therefore$ H = 34.4 ft., and a 36-ft. pole is required, or a 34-ft. pole at a slightly smaller span.

Hence a standard heavy single 34-ft. pole at 316 ft. span would be used, and all parts would be under maximum permissible stress for gale and ice conditions.

Example 3.—Three-phase, 4-wire, 380/220-volt line; conductors $3 \times 3/.147 + 1 \times 6$ s.w.g.; line formation as before (neutral replacing continuous earth). $W = 3 \times .462 + 1 \times .378 = 1.764$ lb. per foot of span. Permissible span (for single poles) = 125 (light)—250 (medium)—500 (heavy). Assume a single medium pole with 250 ft. span, then the conductor dip (for the thinnest conductor) = 3.875 ft. Hence a 28-ft. medium single pole would be used with 250 ft. span.

Example 4.—Vertical formation three-phase, 4-wire 380/220-volt line; conductors $3 \times 7/.136 + 1 \times 3/.180$. $W = 3 \times .522 + 1 \times .509 = 2.075$. Permissible spans (for single poles) = 106 (*l*)—212 (*m*)—424 (*h*) (adopting 212 ft.). Conductor dip = 2.02 ft. $\therefore h = 17 + 2.02 + 4 = 23.02 = 86\ H$ $\therefore$ H = 26.7. Then a 28-ft. medium single pole at 212 ft. span would be required to give regulation clearance under gale and ice conditions.

The effect on pole height, when the dip is corrected to a temperature basis as defined in the regulations, should be compared.

Derivation of Basic Curve to give Dip and Consequent Pole height for any value of "W."

For any pole height "H" we may say that this height is made up of components the values of which are known, except for that due to the dip in the wire or conductor which is required to be given so that the tension shall be just the permissible tension. Thus $H = A + B + C + d$. For average ground conditions the regulations as to overturning are satisfied if $A = .14\ H$.

The clearances required from ground are known to be 20 ft. and 17 ft. for h.p. and l.p. lines, respectively. For average conditions C may be made equal to 2.0 ft.

Then $H = .14\ H + 20$ (or 17) $+ 2.0 + d = .14\ H + 22$ (or 19 $+ d$), *i.e.*, $H = k_1 + 1.16\ d$ (where $k_1 = 25.5$ or 22.1).

The suspended wire will follow the curve of a catenary, but the relation between span, length and dip to obtain a tension S in the conductor may be expressed with sufficient accuracy for general purposes by assuming the wire to follow a parabolic curve when

$$\text{Dip} = d = (L^2/8)\ (r/s)$$

where L = span length, r = resultant of weight due to wind and ice-covered conductor, S = maximum permissible tension in conductor = breaking load/2. But $L = k/W$ to obtain maximum stress in pole; then $d = (k^2/8W^2)(r/s)$, where k = maximum permissible force per class of pole. Then $H = k_1 + (.145\ k^2\ (r))/(W^2\ (s))$.

For the purpose of reference it is useful to obtain a graphical relation between "W" and "H," and thus with the consequent pole height. If we examine the relation between the constant permissible force which may be applied at right angles at a point 2 ft. from the top of any pole of a given class (see fig. 1), it will be seen that there is a relation which is useful in deriving a basic curve, and that for each type the heavy and light poles have values for this force which are, respectively, equal to twice and the reciprocal of twice times the value of the force which may be applied to the medium pole. Thus,

$$k \text{ (light)} : k \text{ (medium)} : k \text{ (heavy)} = \tfrac{1}{2} : 1 : 2.$$
$$k_l^2 : k_m^2 : k_h^2 = k_m^2/4 : k_m^2 : 4\ k_m^2.$$

Thus for a given type of pole, as regards the dip,

$d_l : d_m : d_h = (k_m^2/32W^2)(r/s) : (k_m^2/8W^2)(r/s) : (k_m^2/2W^2)(r/s)$;

e.g., for single poles the values of d would be:—

light poles $d_l = (6{,}050/W^2)\ (r/s)$
medium poles $d_m = (24{,}200/W^2)\ (r/s)$
heavy poles $d_h = (96{,}800/W^2)\ (r/s)$.

The value of (r/s) for copper wires in normal use varies between .0001 and .001 lb. per foot run of conductor, and if it is expressed as being x (.0001) lb. for any wire, where x is the correct value ÷ .0001, we can derive an arbitrary basic expression for H which is general to any normal copper conductor and for any class of pole, *e.g.*,

$$H = k_1 + (1{\cdot}16k^2 \cdot 0001\, x/8w^2) = k_1 + (Ak^2 \cdot 0001\, x/w^2),$$

and $A = 1{\cdot}16/8$, whence $d^1 = (Ak^2 \cdot 0001\, x/w^2)$.

Thus a basic curve may be drawn by giving varying values to "w" and giving k the value of the permissible force for the medium poles in each class from which d_1 may be obtained, and the addition of the relevant value of k_1 (for h.p. or l.p. lines) will give the height of the pole required for a given value of "w." Alternatively the expression may be used to evaluate "d," the real dip, for values of "w," thus giving the dip required under the worst conditions.

It should be noted that the whole of the foregoing design has been based on the assumption that the maximum design conditions occur under gale conditions with simultaneous ice loading. This assumption is not correct in all cases when determining the dip for purposes of calculating the pole height. For any copper conductor there is a certain span (of a high value) at which the dip, occasioned by expansion at the maximum temperature of 122 deg. F., will be equal to, and will then increase more rapidly with an increase in span than, the dip necessary to keep within the limits of breaking stress of the conductor. In the case of very heavy conductors this would occur for very much smaller spans. As has been pointed out previously, however, the purpose of this article is to suggest a method of determining values which are approximately correct and have a tolerance of, say, 5 per cent. As careful examination has shown, the results obtained by adopting the above method are more nearly correct than the results obtained by other methods, in addition to being very much more concise, and the factors of safety existent for overhead line constructions are sufficiently high to allow very much more than the variations mentioned. These are not as great as those which often occur when erection on site commences, and which only an impossible amount of skilled supervision, continually exercised, could obviate.

The curve for dip "d" has been superimposed on that for maximum permissible span (fig. 1), so as to make a convenient reference curve for quickly determining all the pole details required.

There is thus available in this curve a comprehensive statement of all the details required when designing distribution and normal transmission lines using any class of wood pole. With the exception of the erection dip, all design details for any combination of wires are ascertainable immediately without laborious calculation. A very great advantage obtains in that the derived values are inherently the values which give maximum stress results—results which are probably never achieved by former methods involving much calculation.

Instructions for Use of Curve, Fig. 1.

"W" = Windage per foot of all ice-covered conductors in span $= w_1 + w_2$ and so on. Ice loading up to 660 V = .375 in. + wire diameter. Ice loading above 660 V = .75 in. + wire diameter.

Basis of curves: Dip $= (k^2/w^2) \times (r/s) = (k^2/w^2) \times .001 \times$ multiplier; span $= L = k/w$.

(1) *To Find Span.*—From the Tables find the windage "w" per foot of all conductors = sum of windages of each wire, including continuous earth wire, when used. For this value of "w," read off from the span curve on the bottom scale the maximum permissible span which may be used for any pole in the class chosen.

(2) *To Find Dip and Height.*—For the same value of "w," read off, on the dip curve, the corresponding value on the top scale for the same class of pole chosen in determining the span. Multiply this value by the multiplier given in Table 3 or 4 for the thinnest conductor; this gives the dip.

Pole height for most *average* wire formations, H = overall height $= k_1 + 1.16 \times$ dip.

$k_1 = 25.5$ for h.p. conditions, and 22.1 for l.p. conditions.

Example 5.—To find the permissible span and pole required for an 11,000-volt, 3-wire line with 7/14 s.w.g. continuous earth wire; conductors 3/.147. "w" $= 3 \times .712 + 1 \times .66 = 2.796$ lb. per foot of span. From curve: Permissible span (for single poles) = 79 ft. (light), 158 ft. (medium), 316 ft. (heavy). Choosing a heavy single pole, any pole in that class at a span of 316 ft. will be just at the maximum stress.

From the dip curve, when "w" = 2.796, the scale reading for heavy single poles $= .31 \times 4 = 1.24$. Multiplying (see Table II) by 6.06 for 3/.147 conductors gives $d = 6.06 \times 1.24 = 7.514$ ft. Then "H" $= 25.5 + 7.514 \times 1.16 = 34.2$ ft.

Hence a 34-ft. single heavy pole at 316-ft. span will give results which give maximum permissible stress in all the parts.

Example 6.—Three-phase, 4-wire, 380/220-volt line; conductors $3 \times 3/.180$ and $1 \times 3/.147$ neutral. "w" $= 3 \times .509 + 1 \times .462$ (from Table 1) $= 1.99$ per foot of span. Maximum span for single poles. We may adopt a span of 221 ft. Dip $= .61 \times 3.85$ (using multiplier for thinnest conductor) $= 2.35$ ft. "H" $= 22.1 + 1.16 \times 2.64 = 24.82$ ft. Then a single 26-ft. medium pole at 221 ft. span is required.

These results may be checked by calculating the total wind pressure in the span for all wires, and multiplying it by the height from the ground at which the resultant force acts; if then the resultant bending moment due to the windage on the pole is added and the total multiplied by 3.5 to give the required factor of safety, the product should be equal to the maximum bending moment for the diameter at the ground for the pole chosen. In the above cases the following comparative results obtain.

A comparison obtained by using (*a*) the very full fundamental method, and (*b*) the short method outlined above, is given in Table III for the five examples given previously.

TABLE III.

Example.	B.M. due to windage on wire (lb.-ft.).	B.M. due to windage on pole (lb.-ft.).	Total B.M. for calculated installations.	Permissible B.M. for pole derived by method (*a*).	Per cent. error of method.
1 ...	23,900	2,780	93,500	90,720	+3.0%
2 ...	9,690	1,630	39,700	39,090	+1.76%
3 ...	23,900	2,780	93,500	90,720	+3.0%
4 ...	9,240	1,410	36,200	35,730	+1.31%
5 ...	9,150	1,630	37,500	39,090	−4.9%

Average per cent. error for 5 examples = 2.80%

It is therefore claimed that no appreciable error is introduced by the use of this method, the very great advantage being obtained that the pole details are obtainable at once for a given value of w and calculations are practically eliminated. *Probably the most important feature is that the derived pole size is, by hypothesis, the one which gives the maximum pole stress and, therefore, the most economical (stress) result.* A restatement may be made here, which has been briefly mentioned in the statement of ideal conditions. Having determined the maximum span, this span may be used for any pole in a given group, since the previously important question of height and related diameter can be ignored, within limits; this is fundamental to the whole of the method, and will provide the required sag and the ground clearance for the conductor. A question arises, however, when the span just meets the stress imposed by the transverse windage on the wires, but the required sag necessitates an uneconomical (cost) height and a departure from economic stress conditions, as, for example, in the case of a very thin conductor where "w" would be relatively small, giving a long span with a correspondingly very high value of the height required. The decision as to which of the alternatives to adopt, *i.e.*, of retaining the uneconomical height or decreasing the span, is one which can only be made after an examination of the cost of the poles and materials, this examination also being strictly required in the determination of the group of poles to be chosen.

The span length derived by the method was automatically the economic (design) span. In contra-

distinction to this there is an economic (cost) span, *i.e.*, the span which gives the minimum *cost* per mile and which is independent more or less of design considerations. The latter is a span which is determinable for particular conditions and which would require to be used where its value would be *less* than that which produces maximum stress in the parts.

Generally speaking, the matter is more academic, and is not capable of giving general results designed for universal conditions, nor are these results usually required in distribution work. For instance, a distribution line serving a number of houses would require short spans for purposes of frequent tappings (at poles) for services; local conditions, such as wayleave considerations, or the need to run a line along a highway, will often require a type of "single" pole to be used, although it may be financially more economical to use "A" or "H" poles. The consideration of economic cost design is a very large subject, and beyond the scope of this article.

The German Wireless Exhibition.

Increase in Number of Manufacturers and in Competition.

(COMMUNICATED.)

THE German Wireless Exhibition, held this year from August 31st to September 9th, was the fifth national exhibition which has been held in Berlin, and its continued growth in size and in importance is indicative of the extension of the wireless industry, and incidentally of the keenness of competition to be encountered not only in Germany, but particularly in European export markets. The number of exhibitors at the Berlin gathering has grown each year as follows:—

1924	...	...	246
1925	...	...	212
1926	...	...	250
1927	...	...	290
1928	...	...	370

This year the increase was so marked that the industry proved to have definitely outgrown the well-known Wireless Exhibition Hall (a large semi-timbered building erected in 1924, of approximately the same size as the New Hall at Olympia in London). A new hall erected this year at the northern end was also insufficient to accommodate the exhibits, and the remainder

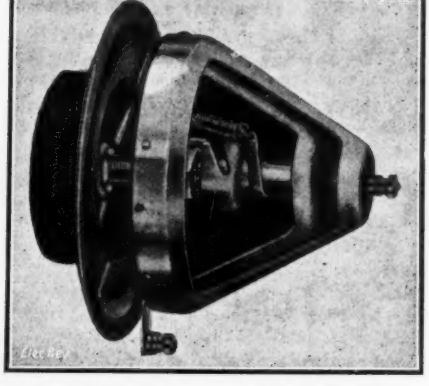


Fig. 1.—New German Variable Condenser.

were housed in one of the large Automobile Halls situated in the exhibition grounds a few hundred yards away.

During the course of the exhibition, demonstrations were given of the new speaking films and of the wireless transmission of pictures by Telefunken apparatus employing the well-known Karolus cell, the time-lag of which is so small as to permit a speed of between 12 and 15 pictures per second.

Novelties in the way of wireless construction appeared to be somewhat less than in former years, most of the components and sets described by their makers as "new" having in fact little, or nothing, to justify that description. Regarding variable condensers, the C. J. Vogel firm has brought out a new condenser of the straight-line frequency type, which consists of an interior cone adjustable on its axis inside an outer cone or mantle (fig. 1). This is a new component, but at its present retail price of 14s. it is hardly likely to make much headway against the regular intermeshing-vane type available with slow-motion control at prices about one-third of the above-mentioned figure in the case of the 0.0005-mfd. size. High-vacuum resistances and condensers are a good deal more used in set construction than they are in this country, and they are produced by numbers of makers.

In set construction, the majority of the "new" sets advertised are mains-operated receivers, and the number of them has grown enormously since the last exhibition. There is a 2-valve mains-operated receiver on the market selling at £4 9s. 6d. retail, which price includes valves suitable for either a.c. or direct current, the set requiring neither anode battery nor accumulators. The same system has been extended to gramophone "pick-ups," and one of the models exhibited incorporated a gramophone operated by a small electric motor, with the electrical sound-box connected to an amplifier and loud-speaker, the valves of the amplifier being also energised from the mains.

The prevalence of small receivers with valves, swinging coils, and control gear all mounted on the top of a small flat cabinet was a marked feature of the exhibition. They constitute the so-called "Volksempfänger" instruments, or "popular" sets, obtainable at such prices as £2 2s. for a 3-valve, and £3 9s. 6d. for a 4-valve instrument, the prices including both patent royalty and coils. The greater portion of the set trade appears to be in this cheap class of instrument. In this connection it was, of course, stressed in the Loewe case recently tried by the Patent Office tribunal in this country that the lower scale of Telefunken royalties is a material factor in permitting the low prices ruling in Germany, with which it would be impossible to compete in this country on account of the scale of patent royalties alone. For instance, the patent royalty on a 5-valve neutrodyne receiver exhibited by the Mende Company and priced at £14 was quoted as 14s. only.

Contrasted with what is to be seen at the English exhibition, portable sets in Germany may be said to be practically non-existent, and the very few examples on view go to show that this is a branch of receiver manufacture to which no attention has yet been given in Germany.

Side by side with the cheap popular instruments already referred to there were shown numbers of examples of higher-class instruments, ranging in price from about £12 upwards, in which English and

American design was very closely followed, excepting that in the case of the still higher priced console sets the design followed the characteristic German fashion in furniture, fig. 2, which differs considerably from what is popular in this country.

The valve section has not developed in Germany to the same extent as the rest of the wireless trade; in fact,

Fig. 2.—An Example of a Console Set.

the German market is very considerably overrun by Dutch and Austrian valves. The main German development in this line is undoubtedly the multiple type of valve invented by Dr. Loewe (figs. 3 and 4), and the factory output of them for last year reached a quarter of a million. It will be remembered that this type of valve is shortly to be manufactured in a branch works in England for the purpose of supplying the English market and British oversea countries.

In reports of previous exhibitions, reference has been made to the extraordinary growth of the loud-speaker industry in Germany, and the exhibits in this class

Fig. 3.—Loewe Multiple Valve and Holder.

seemed to be more numerous than ever. With some eighty makers all engaged upon the mass production of speakers of all kinds, it is only to be expected that there is a disposition to concentrate upon the production of the cheaper models, both for home and export markets, and this policy had an adverse effect upon the quality of a large proportion of the instruments seen and heard at the exhibition. This year the trumpet, or flair, shape is gradually becoming extinct; cabinet and cone speakers have attained a great vogue, and moving-coil instruments and units have made their first appearance.

The growth of the German loud-speaker industry has not been without its own peculiar difficulties. One of the greatest encountered by manufacturers in this line has been the existence of various bodies of patents covering certain details of loud-speaker construction, more especially of the cone type. These difficulties were such that early in the present year there was formed a Patent Protection Association of Loud-

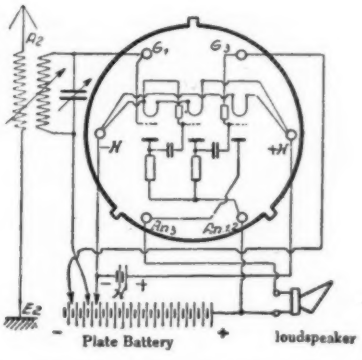


Fig. 4.—Circuit Diagram of 3 I.I. Loewe Valve.

speaker Manufacturers for the purpose of mutual help in investigating the validity of patents which might be quoted against makers, for resisting claims for the payment of royalties, and for the interchange of the patents owned, or controlled, by the members of the Association themselves. The Association is under the chairmanship of Dr. Burstyn, a well-known wireless authority, who is also chairman of the Wireless Manufacturers' Association, and its headquarters are at the same address. The latest development is that the Wireless Manufacturers' Association (Verband der Funkindustrie) has now acquired a general licence for loud-speaker patents, comprising the Standard, Lectophone, Hopkins, De Forest, Huth, Loewe, and Siebt inventions relating to cone speakers, and the usual "warnings" are now being advertised against the purchase, or sale, of instruments which in any way infringe these patents. Many of the loud-speaker catalogues distributed at the exhibition seemed to indicate a last-moment compromise with the Association and the conclusion of a licensing agreement, as errata slips were inserted in many of the lists indicating that retail prices were increased by 1s. 2d. per instrument for patent royalty.

As a whole, it can be said that this year's exhibition showed evidence of a considerable growth in the wireless industry, which is borne out both by the increase in the number of users, and by the growth of exports, but it is evident from any study of prices that much of this may be termed "profitless prosperity." Whether the amount of actual business transacted at the exhibition was great, or small, there is no reliable means of ascertaining, and it is only possible to state that the big attendances in the evenings, particularly on both Sundays, showed no signs of diminution.

According to *The Times*, 50,000 people paid for admission on the first Sunday, and the show has sustained its reputation of being one of the most popular as well as one of the largest of the year in Germany.

The exhibitors numbered 380, besides the 14 official bodies which participated, including the broadcasting, Reichspost, and police authorities, whose displays were well laid out and much admired. The Tri-Ergon speaking kinematograph film, Mihaly television apparatus, and Fulton and Carolus photo-telegraphy systems were demonstrated daily. The price of wireless equipment was not, on the whole, below last year's.

The Fuel Conference.—I.

Proceedings at the Sectional Meeting of the World Power Conference held in London.

THE opening meeting of the World Fuel Conference took place on Monday afternoon at the Imperial Institute, South Kensington, London. The president of the Conference, the Marquess of Reading, G.C.B., G.C.V.O., P.C., welcomed the delegates who, he said, had come from 48 countries to attend the Conference, and Sir Robert Horne delivered the opening address. Sir Robert said that no assembly of scientists had ever come together to discuss a matter more relevant to everyday life, nor had any technical conference ever been held from which so many practical consequences might flow that were vital to the prosperity of the various countries represented. Fuel constituted the basis of our industrial life, and while in certain countries water might be the predominating factor in the production of electricity, there were many countries like Great Britain, in which fuel must always be the main source of power. Fuel of all kinds was within the ambit of the discussions, but two-thirds of the one hundred and sixty-seven papers submitted to the conference dealt with coal. How vital this subject was to the citizens of this country would be appreciated when he reminded them that one-twelfth of our population was dependent upon the coal industry for its livelihood; and that four-fifths of the volume of our exports and one-tenth of their value normally consisted of coal. The coal trade was at present in a state of depression, and there were those who predicted that the day of prosperity in the British coal trade had passed for ever, and that the competition of oil would make it unprofitable to work coal here to anything like the same extent as in the past. Personally, he had never taken that view. The prosperity of Great Britain was created by coal, and by coal it would be saved; but it would only be by adopting improved methods of using it, such as were foreshadowed in some of the papers.

For himself, he looked with most hope to the development of some of the processes for the carbonisation of coal at low temperatures. Many premature claims were made for some of these systems, but a laboratory experiment was no test of commercial success, and unless they could work out the experiment on a commercial scale so as to yield a profit upon the money invested in the operation, nobody was going to throw away his resources in carrying it further. Something like four hundred processes had been tried in this country. The difficulty had been to produce a semi-coke which could easily be consumed, both industrially and domestically, and whose value, along with that of the by-products, would be sufficient to cover the cost of the process and the original raw material. Now, however, he thought, it might safely be said that they were at last emerging from the experimental stage and entering upon the industrial and commercial period of development in connection with some of these processes. In Germany they had succeeded in carbonising brown coal at low temperatures and burning the resultant solid fuels under boilers in super-power stations connected with high-pressure transmission systems. In this way, large areas of Central Germany and the Ruhr had been supplied with electricity, while the surplus gases had been used in the chemical industry. Developments in the works of an electricity supply company had shown what could be done with British coal. By carbonising a comparatively low-grade coal at a low temperature and burning the residual fuel under the boilers, that company had been able, in fact, to pay for the bulk of its raw material with the value obtained for the by-products, and thus succeeded in producing electricity at a price as low as any in the world.

The coming together of so many nations—some of them recently at war with each other—to combine in one common effort to solve their problems was an inspiring picture. In a scientific congress such as that, jealousies, both national and individual, tended to disappear, and those who worked for the advancement of knowledge from other motives than mere personal gain were more ready to exchange ideas than those whose lives were spent in the ordinary processes of barter. Frequently there was more to gain by communicating than by concealing the methods by which success in any particular business was being achieved. If they came to the Conference prepared to give of their best for the common benefit, the results which they achieved by their united deliberations might have a most potent influence upon the future of the world.

Dr. -Ing. E. C. Köttgen, Mr. O. C. Merrill, and Dr. -Eng. M. Kamo replied to Sir Robt. Horne's address.

In the evening the official banquet was held, at the Connaught Rooms, Great Queen Street, London, the Marquess of Reading presiding over some 500 guests.

After the loyal toast, and that of foreign sovereigns and presidents, had been honoured, Sir Philip Cunliffe-Lister, K.B.E., M.C., President of the Board of Trade, proposed "The Fuel Conference." He referred to the wide scope of the Conference, as indicated by the papers submitted, and emphasised the importance of pooling knowledge, not only within an industry but internationally, as leading to progress and prosperity for both producers and consumers, whose interests were largely identical. Cheaper production of manufactured goods was of vital importance, enabling more to be produced and more men to be employed, and this would be hastened by the efficient use of fuel. By proper classification, cleaning, and grading of coal, uniformity of quality would be secured, the seller would get better value for his output, and the buyer better value for his money. There was a great future for pulverised fuel on land and sea, and the completion of the national "grid" would enable low-grade coal to be utilised. The publication of the report of the National Fuel and Power Committee was most timely, and he was glad to announce that the Government would at once adopt the Committee's suggestion that an investigation should be set on foot in a wide industrial area, with regard to the consumption and utilisation of coal-gas and the cost of installing interconnecting gas mains; for the purpose of that inquiry he confidently sought the co-operation of representatives of the various interests that were affected. Greater use should also be made of the facilities for industrial research offered by the universities.

Responding to the toast, Lord Reading expressed his appreciation of the privilege of presiding over the Conference; no country, he said, could now afford to disregard the importance of applying power and science to industry. The object of the Conference was to increase the common stock of knowledge, irrespective of individual interests—a great ideal, and one of the strongest factors for peace.

The toast of "Our Guests" was proposed by Sir David Milne-Watson, D.L., who referred to the influence of such gatherings on the cause of world peace; the toast was responded to by Mr. Marin Guillaume, Dr. E. Tissot, and Mr. F. V. Hansen, respectively presidents of the National Committees of France, Switzerland, and Sweden. Finally Col. R. K. Morcom, C.B.E., in an admirable speech, proposed the health of the Chairman, who briefly responded to the compliment.

On Tuesday morning the regular sessions began, Section A: The Coal Industry, and Section E: The Oil Industry—Economic and General Considerations, being followed by Section N: Internal-Combustion Engines.

In the afternoon Section B: Sampling and Testing of Solid Fuels, and Section F: Composition, Storage, &c., of Liquid Fuels—were dealt with. In the evening there was a reception by the Government at Lancaster House, London.

The Sampling and Testing of Coal.

(Abstract of Paper prepared by the GESELLSCHAFT FUR WARMEWIRTSCHAFT, *Vienna.)*

The regulations for the sampling and testing of coal discussed in this paper have been adopted in Austria as the result of investigations by the Gesellschaft für Wärmewirtschaft, Vienna. The errors, due to wrong methods of selection of coal samples, are considerably greater than the irregularities in technical analysis. To obtain an average sample, a number of pieces of varying size, in proportion to their occurrence in the coal to be tested, must be taken, as usually the ash and moisture contents vary with the size of the coal.

The preparation of a test sample requires three operations:—(1) Selection. (2) Preparation of the actual quantity required for the laboratory test. (3) Packing and dispatch. The surest method of selection is carried out during loading operations; a shovelful can be taken at regular intervals whilst the coal is travelling down the chute. For a total quantity of 1,000 kg. about 10 or 20 kg. should be withdrawn. For 10,000 kg. (one railtruck), about 50 kg. Larger samples are required if the size of the coal varies much. If the coal is loaded in small tubs or other containers, whole tub loads must be selected at regular intervals. To get an average selection from stored coal is rather difficult, as it is essential that samples should be taken from the centre and bottom as well as the surface of the dump. For chemical analysis at least 3 kg. is required; but as much as 100 kg. may be necessary for technical industrial tests.

The preparation of the laboratory sample is best done on a smooth clean floor. The larger pieces are crushed and the whole well mixed. After dividing diagonally into four equal parts, two opposite piles are removed. This process is continued until the required quantity is left. Delay in this operation must be avoided, to preserve the moisture content.

To give an example of the methods of analysis at present in use, those employed in the laboratories of the Technische High School, Vienna, are considered. The moisture content was formerly determined by heating the coal for one hour at a temperature of 106 deg. to 110 deg. C. The latest experiments, however, have shown, principally with fuels of an oxidisible nature, that this method is unsatisfactory. For this reason xylol is employed for determination of the moisture content at this Institute. The coking test can be carried out in connection with the moisture test (1 gramme). Formerly little attention was paid to the crucible and temperature used in coking. Experiments by Strache and Mika have, however, led to the general use of platinum crucibles for the coking test of hard coal; the temperature is kept at 900 deg. C. for seven minutes. Brown coals are carbonised in a Rose crucible by the application of a gas flame. The loss of weight during carbonisation represents the amount of volatile substance present. The coke is then burnt by tilting the crucible over a flame and the remaining ash weighed.

The melting point of the ash is determined either in an oxidising or reducing atmosphere. For the first method a few grains of ash are placed on an electrically-heated platinum strip and kept under observation with the aid of a microscope, while the temperature is raised until the ash melts. At this stage the temperature of the platinum strip is taken with a Hohlborn-Kurlbaum-pyrometer. For the second method, an electric tube furnace is required, the heating wire of which is of molybdenum. The tube containing the pyramidal piece of ash of 15 to 20 mm. height, can be filled with any reducing gas. The melting is watched with the assistance of a microscope and the temperature determined with a Chatelier pyrometer. The calorific value is obtained by the well-known Berthelot-Mahler process in a stainless-steel bomb. For very volatile substances a Junker's calorimeter is used.

For the gasification test, about 0.2 gm. is placed in a tube, designed by Hiller, and the quantity of gas, collected in a Hempelburette, is calculated to 0 deg. C. and 760 mm. The calorific value of the gas obtained is best determined in a Strache-Löffler caloriscope. If larger quantities are to be handled, about 20 to 50 gm. is tested in an aluminium retort, the gas being collected in a small gasholder. Tar and water are determined together and then the water separately by the xylol method. The amount of gas obtained is calculated at 0 deg. C., 760 mm. This method of analysis permits direct investigation of the chemical composition and density of the gas. Carbon and hydrogen are determined at the same time by the combustion of about 0.2 gm. in a tube, filled with copper oxide, through which a current of oxygen is passed. A Frerich-Normann gas stove or an electric tube heater can be used. Lead oxide heated to 180 deg. C. is used to retain the sulphur and nitrogen compounds. The test is carried out in a current of oxygen, and both absorption tubes, the calcium chloride and soda-lime tubes, are always weighed, filled with oxygen. It is well known that the latter should be filled at the outlet to one-sixth of its volume with calcium chloride. For the determination of sulphur, two tests are made.

Fuel Oil for Heavy Oil Engines.

By HAROLD MOORE.

(Abstract of Paper presented on behalf of the DIESEL ENGINE USERS' ASSOCIATION.

Though the makers frequently state that their Diesel engines will operate on high-gravity residual oils, the oils actually used, both for land and marine service, are either distillates or very light residua. At present, as ample supplies of low-gravity residua are available at low prices, there is no incentive to use heavy residues.

The coal tars have been burnt in heavy oil engines with more or less success. Those of high free carbon content have not been found satisfactory, but a great deal of vertical retort tar has been employed in Germany. This fuel appears to have given the greatest satisfaction on large two-stroke Diesel engines, probably on account of the absence of exhaust valves, which appear to be the most sensitive part of the engine when refractory fuels are being burnt. All the coal-tar products possess comparatively high spontaneous ignition temperatures, and therefore do not ignite in a Diesel engine with the same ease as petroleum products. Several methods have been adopted for overcoming this difficulty, the most obvious being to raise the compression ratio of the engine. As, however, very high compression pressures are inclined to cause mechanical trouble, this method is not particularly satisfactory, and in many cases users have employed normal compression ratios which will operate satisfactorily when the engine is running on heavy loads, but which are insufficient to bring about ignition under starting conditions. To overcome this difficulty, the engine has been started up on petroleum oil and run on this fuel until it is thoroughly warmed. A still more satisfactory method is by the use of pilot ignition gear, whereby a small charge of petroleum oil is introduced into the cylinder immediately prior to the main charge of the coal-tar product. The quantity of ignition oil required is usually approximately 5 per cent. of the fuel. It has the effect of producing ignition and warming up the combustion space to a sufficiently high temperature to bring about satisfactory combustion of the less easily ignitable coal tar product. With the use of this gear practically all the higher boiling coal-tar distillates may be used in heavy-oil engines. There is no question of the suitability of coal tar products. If available at economic prices they are perfectly satisfactory fuel for Diesel engines. They possess a slightly lower heat value, but experience has shown that, probably on account of their lower viscosity, they give a slightly higher thermal efficiency than petroleum oils. In the event of a petroleum shortage, there is no doubt that they would be largely used as Diesel-engine fuels.

Animal and vegetable oils, in spite of their fundamentally different chemical constitutions, behave very similarly to petroleum products when used as fuels for Diesel engines. The pilot ignition gear used for tar oils is quite unnecessary when burning saponifiable oils. In 1924, the British Engineering Standards Association published a set of four specifications dealing with fuel oils for heavy oil engines. They cover all oils originating from shale or petroleum, and are practically the only fuel oil specifications in use in this country at the present time. All four call for a minimum flash point (P.M.) of 150 deg. F. The maximum allowed for the asphalt content varies from 0.5 to 12 per cent. throughout the range of the specifications and, whilst a maximum ash content of 0.05 per cent. is stipulated for three of the oils, 0.01 per cent. is stipulated for the thinnest. The viscosity and cold test vary throughout the series of specifications. In deciding the nature of the oil to be used on a Diesel engine it is necessary to make allowance for the design of the engine itself. This factor can only be judged by experience, but large, slow-running engines are generally capable of burning the more asphaltic oils better than smaller and faster engines. Engines running on very variable loads are also more sensitive, and operate better on distillate fuels. The compression ratio or maximum compression pressure also has a bearing on the capabilities of the engine for burning heavy fuel. High compression assists in the burning of heavy oils, as it results in a higher maximum temperature. The amount of compression necessary is, however, very much influenced by the dimensions of the cylinders, larger engines reaching a higher cylinder temperature than smaller engines having the same compression ratio.

Another point which has to be considered is the mean effective pressure at which the engine has been rated. Difficulty may be experienced in burning a given oil at full load in an engine rated at a very high m.e.p., whereas it may give no trouble at a somewhat lower rating.

The method of injection also influences the capabilities of an engine for burning heavy fuel. In the past the author considered that engines provided with compressed-air injection could burn the heavy oils more efficiently on account of superior spraying and turbulence. Mechanical injection has now been greatly improved and, at the present time, there is probably very little to choose between the two systems. Mechanical injection engines are capable of giving similar results to compressed-air engines without necessitating the same high compression ratios, the cooling effect of the blast, which affects the cylinder temperature considerably, being absent.

D

Business and Industrial Notes.

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations and Failures.

Registered Electrical Contractors.

Applications from the following for registration were accepted by the Executive Committee of the National Register of Electrical Installation Contractors at a meeting on September 14th :—

Pain & Lungley, South Norwood, S.E.
McCartney, G. M., Belfast.
Porter, F., Thongsbridge, near Huddersfield.
Thistlethwaite & Edgar, St. Annes-on-Sea.
Gibbs & Parker, Oldham.
Crookall, C. E., Poulton-le-Fylde, Blackpool.
Fletcher, H. E., Oldham.
Shemelds, Ltd., Belfast.
Lincolnshire Electrical Co., Ltd., Cleethorpes.
Johnson & Co., Belfast.
Walker & Hutton, Scarborough.
Dolby, W. H., Wallasey.
Elsworth, H. W., Bexhill-on-Sea.
Ardis, R., Belfast.
Thomasson, Wilfred, & Co., Shrewsbury.
Barrett, W., Bath.
Bush, H. L., & Co., Bath.
Wordley, F. T., St. Leonards-on-Sea.
Walter, W. G., Bath.
Turner, E. T., Epsom.
Riley, T., Tunstall, Stoke-on-Trent.
Farr, J. & S., Ltd., Nottingham.

At the same meeting three applications for registration were withdrawn and five were declined.

New Zealand's Import Trade.

The Officer-in-Charge of the Wellington (N.Z.) Trade Commissioner's Office has forwarded to the Department of Overseas Trade a report upon New Zealand's import trade during 1926 and 1927. In the course of this it is stated that the imports of copper wire declined from £241,786 in 1926 to £186,095 in 1927, but the United Kingdom's share of this trade rose from 79.2 to 90.4 per cent. Vacuum cleaners were shown separately in 1927 for the first time. The total value of imports was £16,029, contributed by Canada (£8,116), the United States (£3,135), Sweden (£2,934), the United Kingdom (£1,064), and Germany (£780). The imports of electric batteries and cells rose to £152,060 in 1927. The bulk of these was supplied by the United States (£93,323); the United Kingdom's share was £36,770, and that of Canada £18,730. There was a fall from £564,192 to £518,208 in the imports of generators, motors and transformers, but the United Kingdom's share rose from £279,320 to £322,490. The proportions supplied by the United States and Sweden showed notable decreases, but, thanks to purchases on Government account, Germany's quota rose from £13,629 to £40,021. The United Kingdom has steadily improved her position in the imports of insulated cable and wire at the expense of the United States, and in 1927 claimed £484,781 out of a total of £520,534; the United States accounted for £7,353, Canada for £10,023, Belgium for £10,269, and Germany for £4,444. The total value of imports of incandescent electric lamps was £152,186, of which the United Kingdom supplied £100,226, the United States £17,178, and the Netherlands £29,034. In telegraph and telephone apparatus (including wireless) there was a rise from £295,817 to £391,149. The United States led in this section with £178,271, the next being the United Kingdom (£93,918), Belgium (£72,003), the Netherlands (£12,534), Australia (£7,913), Sweden (£5,067), and Canada (£4,939).

Large French Amalgamation.

As a result of the programme explained at the last general meetings, the Société Alsacienne de Constructions Mécaniques and the Compagnie Française Thomson-Houston are now proceeding with the formation of a joint company under the title of the Société Générale de Constructions Electriques et Mécaniques, which will take over and continue the electro-mechanical manufactures hitherto carried on separately by the two founder companies. The initial capital of the new company is 298,500,000 fr., comprising 250,000,000 fr. in shares allotted to the founders for the assets brought into the company, and 48,500,000 fr. in shares which have been subscribed in cash by friendly groups of manufacturers and financiers. An augmentation of the capital by about 150,000,000 fr. will be undertaken after the definite constitution of the new company, and the shareholders in the parent companies will receive preferential treatment.

Electricity in a Carnival.

The West Wilts. Electric Light & Power Co., Ltd., again participated in this year's Trowbridge Hospital Carnival The company undertook the hire of fittings and lamps, including erection and the supply of electricity to shopkeepers and others for the illumination of their premises. Although only a comparatively small town of 13,000 inhabitants, over 80 consumers took advantage of the scheme, individual premises being illuminated with from 50 lamps to over 600 lamps in the case of large premises. At the front of the George Hotel the company erected a huge magnet reaching to the top of the building and provided with over 600 red lamps, large collection boxes being placed at its base. The display on the company's offices consisted of a large map of the company's e.h.p. system, and the towns and villages supplied with electricity. The lines were picked out in red lamps, which were operated by a flasher, lighting up in sequence. The Park where most of the carnival festivities were held was illuminated with over 2,000 lamps. The company also carried out a scheme of flood lighting of the Town Hall. The company's entry in the carnival which secured a special prize, consisted of a tableau representing "the old and the new," and was designed to emphasise the advantages of electric light as against other methods of illumination.

Indian Electrical Imports.

The official trade statistics for the April-June quarter of this year (reproduced in the *Board of Trade Journal*) show that the total value of electrical machinery imported into India rose from Rs. 50 lakhs in April-June, 1927, to 54 lakhs. The United Kingdom increased its share from 41½ to 43 lakhs and the United States from 2½ to nearly 7 lakhs. Imports from Germany remained steady at over 2 lakhs. The total imports of electrical instruments and apparatus rose from 71 lakhs to 79 lakhs. The British share advanced from 44½ to 49 lakhs, that of Germany from 7 to 8½ lakhs, Holland's from 3 to 4½ lakhs, and Italy's from 3 to 3½ lakhs. Imports from the United States fell slightly from 9½ to 9 lakhs. Analysing the above total the imports of electric wires and cables rose from 22 to 23 lakhs, the increased trade being entirely secured by the United Kingdom, whose share advanced from 18¼ to 21½ lakhs. Germany supplied 1 lakh and Holland Rs. 69,000. The trade in electric glow lamps and parts thereof, which rose from 5½ to 8¼ lakhs, was divided between Holland (3 lakhs), the United Kingdom (2 lakhs), Germany (¾ lakh), and "other countries" (2½ lakhs). Electric lamps of other kinds, amounting to 4 lakhs, were obtained from the United States (2¼ lakhs), Germany (¾ lakh), and the United Kingdom (¼ lakh). Electric fans to the total value of 9¼ lakhs were obtained from the United Kingdom (4¾ lakhs), Italy (3 lakhs), and "other countries" (1½ lakhs). Of a total of 12 lakhs' worth of unenumerated electrical apparatus, the United Kingdom supplied 7 lakhs, and the United States and Germany 2 lakhs each. Accumulators were imported to a total of 3½ lakhs, of which the United Kingdom supplied over 3 lakhs. Meters and switchboards were almost entirely obtained from the United Kingdom, but of the 4 lakhs' worth of batteries imported, the United States supplied 2½ lakhs, the United Kingdom Rs. 45,000, and "other countries" over a lakh.

Cost Accountants' Conference.

The seventh National Cost Conference organised by the Institute of Cost and Works Accountants is being held to-day (Friday) at the Queen's Hotel, Birmingham. Mr. A. Ramsay (chairman of the Engineering and Allied Trades Employers' Federation) is to open the conference and preside at a subsequent discussion on "Cost Accounting and the Industrial Future," to which contributions will be made by Messrs. J. A. Lacey and J. Wardropper, B.Sc., B.Com., and Prof. J. F. Rees, M.A., M.Com. In the afternoon Sir Holberry Mensforth, K.B.E. (managing director of Messrs. Bolckow, Vaughan & Co., Ltd.), will take the chair. The subject of "The Standardisation of Cost Accounts" will be introduced by Mr. Bernard Thistlethwaite, and a discussion will be opened by Mr. D. L. Moran. The annual dinner of the Institute takes place in the evening.

Swedish Electrical Exports.

The *Swedish Economic Review* shows that during the first seven months of this year the value of electrical machinery exported from Sweden was 25,181,000 kr., as compared with 17,944,000 kr. in the corresponding period of 1927. The exports of telephone and telegraph apparatus were valued at 7,177,000 kr., against 4,636,000 kr.

The F.B.I. and the Income Tax Law.

The Federation of British Industries, among other bodies, was recently asked for its views and suggestions regarding the proposed codification of the income tax laws. The Taxation Committee has now received a report from a special sub-committee which was formed to deal with the matter. It is suggested by the sub-committee that the subject should be covered by two Acts dealing, respectively, with the scope of the charge to tax and administration. The first Act should be divided into four parts as follows:—(1) Income-tax: To include the charging rules of the schedules. (2) Surtax: To include the whole of the existing provisions relating to surtax and supertax. (3) Exemptions, abatements and reliefs. (4) Returns, assessments and appeals. The sub-committee is of the opinion that the existing schedules and rules applicable can be amalgamated into three headings: (1) Income arising from occupation or ownership of land (tenements, hereditaments, &c.) in the United Kingdom. (2) Profits arising from the carrying on of any trade, business, profession, employment or vocation carried on in the United Kingdom. (3) Investment income, including all taxable income from foreign sources.

Book Notices.

"True Radio Reproduction." Pp. 87; illustrated. Hollinwood, Lancashire: Ferranti, Ltd.—The first edition of this excellently produced booklet, Wb404, proved to be of considerable value to constructors and experimenters. The revised edition, which has been prepared for the Olympia Exhibition, is presented in the light of increased knowledge of the subject, and should accordingly be even more successful.

"The Use of Nickel in Non-Ferrous Castings" is the latest bulletin published by the Bureau of Information on Nickel, Ltd., 2, Metal Exchange Buildings, Leadenhall Avenue, E.C.3. The Bureau has sent this, together with its other publications, in a thumb-indexed folder. A great amount of useful information is thus gathered together.

"Thermal Conductivities of Walls, Concretes and Plasters."—Building Research Technical Paper No. 6 of the Department of Scientific and Industrial Research (H.M. Stationery Office, price 9d. net).

"An Introduction to the Theory of Eddy-Current Heating," by C. R. Burch and N. Ryland Davis. Pp. 72; figs. 14. London: Ernest Benn, Ltd. 12s. 6d. net.

The Factory Lighting Campaign.

A conference in connection with the Factory and Workshop Lighting Campaign has been arranged for the Newcastle Area to be held in Sopwith's Lounge on October 5th. Mr. H. E. Hughes, of the Scottish Lighting Service Bureau, will be the lecturer, and Mr. S. E. Monkhouse, M.I.E.E., will take the chair. At Glasgow a meeting has been arranged for the same date in the Christian Hall, 70, Bothwell Street, Glasgow, when Mr. S. E. Evans, of the Newcastle-upon-Tyne Lighting Service Bureau will be the lecturer, and Mr. McLaughan MacLeod, M.I.E.E., will be in the chair.

Another Post Office Contract Placed Abroad.

It was announced this week that an order for bronze wire for the telephone system had been placed with a German concern by the General Post Office. This follows the placing of a similar order with the Tréfileries du Havre. The Post Office states that before placing these orders every effort was made to induce British manufacturers to quote "a reasonable price" and a price allowing a substantial margin over the foreign offers was suggested to them.

Municipal Show Windows.

The accompanying illustration (fig. 1) shows the window of the Bradford Corporation Electricity Department showrooms

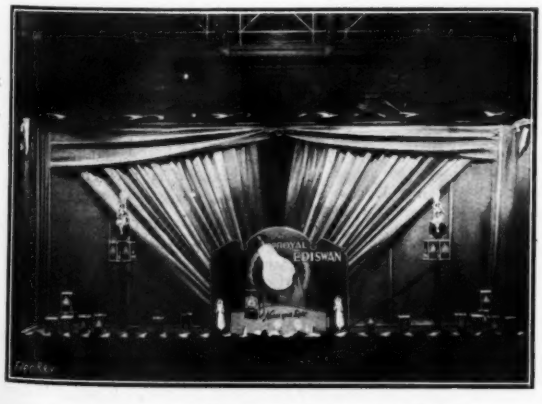


Fig. 1.—An "Ediswan" Display at Bradford.

dressed with "Ediswan" display material. The fan-like background is composed of rolled paper of varying shades of rainbow hues. The large representation of a "Royal Ediswan" lamp in the centre-piece conceals a lamp controlled by a flasher. The rest of the window is amply filled by the few cartons and cut-outs of the "Ediswan" nurse.

Another recent example of window dressing was at the showrooms of the Croydon Electricity Department. This dis-

Fig. 2.—A "Siemens-Xcel" Display at Croydon.

play is illustrated in fig. 2, and, as will be noticed from the sign above it, it consisted of a collection of "Siemens-Xcel" domestic appliances. The principal attraction was a "Cosy-glo" fire embodying a moving flame and smoke effect. A number of bowl and other fires appeared and in the front of the window there were examples of "Xcel" irons, &c.

Recent Contracts.

Messrs. T. HARDING CHURTON & CO., LTD., Leeds, have received from International Combustion, Ltd., an order for 53 three-phase motors, ranging in size from 1 h.p. to 200 h.p., and making in the aggregate 2,900 b.h.p. for the boiler house equipment of the new Leeds Corporation power station at Kirkstall.

According to the *Financial Times*, the PIRELLI-GENERAL CABLE WORKS, LTD., Southampton, has received a contract for e.h.p. cable, valued at £171,000, from the Sydney (N.S.W.) Municipal Council. Another order secured by the company is for a long-distance telephone cable between London and Maidenhead, for the General Post Office, valued at £70,000.

The ENGLISH ELECTRIC CO., LTD., has sent us details of recent contracts of an aggregate value of about £250,000. Further mention of these will be made in our next issue.

South-East England Electricity Scheme Contracts.

The Central Electricity Board has placed contracts, amounting in all to about £1,000,000, for the construction of the 132,000-V transmission lines in the area of the South-East England scheme as follows: For Part I, covering the northern portion of the area, with the GENERAL ELECTRIC CO., LTD. For Part II, covering the southern portion of the area, with CALLENDER'S CABLE & CONSTRUCTION CO., LTD.

The GENERAL ELECTRIC CO., LTD., has given us some details of its contract, the value of which is nearly £500,000. The contract covers the erection of lines in the district north of the Thames, stretching from Reading on the west to Peterborough on the north, and Ipswich and Colchester on the east. The total length will be 254 miles, of which approximately 158 miles is to consist of single-circuit line and 96 miles of double-circuit line; the total actual length of conductor will be 1,300 miles. Steel-cored aluminium conductors will be employed having an equivalent copper section of .175 sq. in. These conductors will be carried on lattice steel towers about 66 ft. high and 16 ft. square at the base, the normal span being 900 ft. The contract will be carried out with the assistance of the G.E.C.'s associated company, the Pirelli-General Cable Works, Ltd., which company will carry out all the actual erection work. The work will take in all three years, and employment will be given by the actual erection work to between 500 and 1,000 men. The whole of the material used in the contract will be manufactured in Great Britain.

Unemployment.

There was a satisfactory decrease (24,680) in the number of registered unemployed during the week ended September 10th. At that date the total was 1,300,000, as compared with 1,324,680 on September 3rd and 1,052,550 on September 12th, 1927.

Campbell Gas Engine Co., Ltd.

Mr. Gilbert P. Norton, the receiver and manager of this company, announces that he has disposed of the assets and the business has now been handed over. He is, therefore, no longer responsible for payment for goods, and orders will no longer be signed on his behalf. Messrs. George Cohen, Sons and Co., Ltd., successors to the company, Halifax, have issued a circular stating that they hold themselves responsible for the payment for all goods ordered by the receiver or on his behalf.

Bankruptcy Proceedings.

J. D. RIDLEY, trading as the Eastern Counties Electrical Construction Co., 41, Butter Market, Ipswich, electrical engineer. The following are creditors in this matter:—

	£		£
Foster Engineering Co.	30	Metro - Vick Supplies, Ltd.	132
General Electric Co., Ltd.	54	Tungstalite, Ltd. ...	23
Johnson & Phillips, Ltd.	542		

T. BARNETT, electrical contractor, Mapperley, Notts., late of Sherwood, Nottingham, and Mansfield.—Receiving order made September 13th, on debtor's own petition. First meeting held September 27th, at the Official Receiver's offices, 22, Regent Street, Nottingham. Public examination, November 1st, at the County Court House, Nottingham.

J. E. DAWSON, wireless engineer, High Street, Boston.—Trustee, Mr. C. G. Compton, 5, Church Close, Boston, appointed September 15th.

A. L. WEEKES, electrical engineer, 13, Crescent Road, Luton.—Last day for proofs for dividend, October 2nd. Trustee, Mr. A. J. Rogers, Official Receiver, The Parade, Northampton.

R. HILTON, electrical engineer, 81, Blackburn Street, Radcliffe, Lancs.—First and final dividend of 4s. 9d. in the £, payable October 1st, at 16, Silverwell Street, Bolton.

S. PERKINS, wireless dealer, 1, Lodge Lane, Beeston, Leeds.—First meeting October 1st, at the Official Receiver's office, 24, Lower Bond Street, Leeds. Public examination October 23rd, at the County Court House, Leeds.

R. H. NICHOLSON (W. Nicholson), electrician, &c., 8a, High Street, Mexborough.—First and final dividend of 2½d. in the £, payable at the Official Receiver's offices, 14, Figtree Lane, Sheffield.

Company Liquidations.

N.K. (BRADFORD), LTD., electricians, &c., Cecil Chambers, 76, Strand, W.C.2.—The first meetings of creditors and shareholders were held on September 18th, at Carey Street, W.C., before Mr. E. T. A. Phillips, Assistant Official Receiver. A statement of affairs was presented showing total liabilities of £11,750 and a total deficiency of £9,274 with regard to contributories, the issued capital being £2,000, of which 1,998 shares were allotted as fully paid to the promoter and 2 were subscribed for cash by the signatories to the memorandum and articles of association. The chairman reported that the company was formed as a private company in July, 1926, to carry on business as manufacturers of and dealers in electric lamps, fittings, &c., and generally to carry on business as electricians. The promoter, A. W. Kimber, also acted as managing director at a salary of £500, with expenses up to a total of £250 per annum and a commission of 5 per cent. on the turnover. He states that the total amount received by him was about £850. Napier-Kimber, Ltd., was registered on November 23rd, 1913, to carry on business as manufacturers of and dealers in lighting fittings and accessories and to take over the branch business in London of Cunningham; Ltd., electrical engineers. The purchase consideration was fixed at £600. Mr. Kimber was managing director of Napier-Kimber, Ltd., and, with his wife, constituted a majority of the directors of that company until November, 1924, when they resigned. That company carried on a branch business at Bradford; a receiver for the debenture holders was appointed in February, 1925, and a resolution for voluntary liquidation was passed the same month. In March, 1925, Mr. Kimber purchased the Bradford business of Napier-Kimber, Ltd., from the receiver for £2,989, and for a short time continued business at Bradford under the style of Napier-Kimber & Co. On April 3rd, 1925, N.-K., Ltd., was registered with a nominal capital of £2,000, and Mr. Kimber held practically the whole of the shares. Under an agreement dated April 22nd, 1925, Mr. Kimber sold his business with all the assets and liabilities to N.-K., Ltd., as from February 1st, 1925, for £2,998, payable as to £1,000 in cash and £1,998 in shares. N.-K., Ltd., in addition to carrying on business at Bradford, traded in London in electrical apparatus. The present company was registered as N.-K. (Bradford), Ltd., in order that the Bradford business might be carried on separately. On August 19th, 1926, N.-K., Ltd., sold the Bradford business to this company for £5,000, payable in cash. In addition, this company took over the liabilities of N.-K., Ltd., to the amount of £849. Under another agreement, dated August 19th, 1926, the company agreed to allot to Mr. Kimber 1,998 shares as consideration for services rendered. The cost to this company of the business and other property acquired from N.-K., Ltd., amounted to £6,998, which included £4,491 for goodwill. That sum was based on a prospective turnover of £20,000 per anuum, but the turnover for the previous eight months was only £6,832, and the trading during that period had resulted in a loss. Apparently the transactions were carried through solely for the benefit of Mr. Kimber. The turnover of the company's business during 1926 amounted to £10,681, and a net profit of £240 was earned. During March, 1928, the bankers demanded repayment of the company's overdraft and interest, £4,368, and in default of compliance appointed Mr. R. G. Sidford as receiver and manager. The failure of the company was attributed by Mr. Kimber to general bad trade conditions. In the opinion of the Official Receiver it was also due (*a*) to the fact that goods had been sold at an insufficient margin of profit; (*b*) to the too-heavy overhead charges; and (*c*) to lack of required working capital. The receiver, who had sold the property of the company and collected certain book debts, had paid £2,550 on account of the debenture holders' claim. There was no prospect that the assets would realise sufficient to discharge the balance of that claim, and consequently there would be nothing for the unsecured creditors. The following are creditors for £50 or over:—

	£		£
Armorduct Cable Co. ...	90	New England Glass Mica	84
Beardsall, W. C., & Co., Ltd.	50	Northern Steel & Hardware Co., Ltd.	81
British Driver - Harris Co.	217	National Electrical Supplies	692
Crabtree, J. A., & Co., Ltd.	132	Oldham & Sons, Ltd. ...	54
Collinson, H. R., & Co.	54	Parsons, C. H., Ltd. ...	66
Cryselco, Ltd.	73	Rees, C. H., & Co. ...	100
Electric & Ordnance Accessories Co., Ltd.	98	Siemens Electric Lamps and Supplies, Ltd. ...	79
Electric Cables, Ltd. ...	234	Scandinavian Cable and Rubber Co.	159
Fouleyn & Co., Ltd. ...	192	Tipper Bros.	123
Hotpoint Electrical Appliance Co., Ltd. ...	65	Vincent Switchgear Mfg. Co., Ltd.	65
Lucas, H. & G. O., Ltd.	101	Vandam, A.	410
Metro-Vick Supplies, Ltd.	148	Walsall Hardware Mfg. Co.	85
McDougall, J., Ltd. ...	80	Furnace Fire, Ltd.	2,518

LAMB & CO. (WESTCLIFF), LTD., Westcliff-on-Sea, Essex.—The first meeting of the creditors was held recently at 29, Russell Square, W.C., when a statement of affairs was presented which showed liabilities of £241, against assets, after deducting preferential claims, of £59. The following are creditors:—

	£		£
Electric Cables, Ltd. ...	22	Swan Electric Co., Ltd.	26
Lamb, A. A.	94	Vulcan Electrical & Mechanical Co., Ltd. ...	49

RIDGWAY STORAGE BATTERY CO., LTD.—Winding up voluntarily. Liquidator, Mr. W. H. Dunning, 11, Springfield Road, Kingston-on-Thames.

HESWALL ELECTRIC LIGHT CO., LTD.—A meeting of members is called for October 22nd at 31, James Street, Liverpool, to hear an account of the winding up from the liquidator, Mr. A. Bailey.

DORSET & DEVON ELECTRICITY SUPPLY, LTD.—A meeting of members is called for October 22nd, at the offices of Messrs. Pix & Barnes, 24, Coleman Street, E.C., to hear an account of the winding up from the liquidator, Mr. F. P. Barnes.

Private Arrangements.

T. BARNETT, electrical contractor, Mapperley, Notts.—The creditors herein met on September 6th, when a statement of affairs was submitted which showed liabilities of £1,879 and net assets of £337, leaving a deficiency of £1,542. The creditors decided that the debtor should be given time to submit an offer. The following are creditors:—

	£		£
Edison Swan Electric Co., Ltd.	141	British Driver-Harris Co.	32
Mayall & Co.	84	Stubbs, C. P.	30
Hough Bros, Ltd. ...	43	Scott & Sons	26
Stern Electric Co., Ltd.	37	Detex Distributors, Ltd.	22
		Brilliant Sign Co., Ltd.	20

Since this meeting, a receiving order has been made (*vide* "Bankruptcy Proceedings").

Dissolutions of Partnership.

JENKINS & MORELAND, motor, electrical and wireless engineers, Wokingham.—Mr. G. Jenkins and Mr. A. E. Moreland have dissolved partnership. Mr. Jenkins will attend to debts and continue the business.

WARD & ANDRESON, decorators and electrical engineers, 6, Station Road, Upminster.—Mr. C. L. Ward and Mr. J. C. M. Andreson have dissolved partnership. Mr. Ward will attend to debts.

The London Power Co., Ltd.

The head office building of the above company in Horseferry Road, Westminster, has been named "Ergon House." All communications should therefore be addressed as follows: London Power Co., Ltd., Ergon House, Horseferry Road, Westminster, S.W.1.

The Marking of Imported Copper.

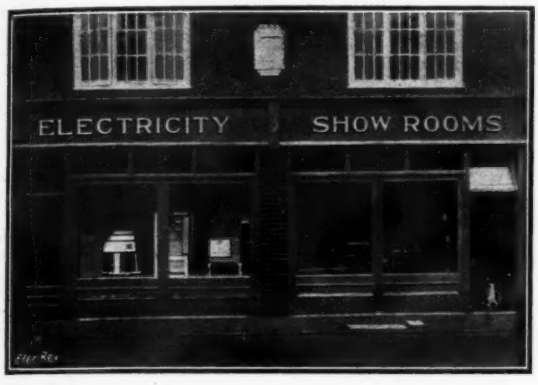
As the result of an inquiry into the matter, the Board of Trade Standing Committee under the Merchandise Marks Act, 1926, recommends an Order-in-Council requiring the marking of imported copper plates, sheets, strips, rods, wire (other than insulated wire), and tubes with an indication of origin. It is proposed that the Order shall have effect three months after the date on which it is approved. The methods of marking are prescribed in an annex to the Committee's report, which can be obtained from the Stationery Office at 2d. net. (Cmd. 3199.)

New French Company.

La Société des Accumulateurs Slem is the name of a new company which has lately been formed at Levallois-Perret, Paris, with a capital of two million francs, to manufacture accumulators.

Electrical Exhibition at Cannock.

Within a few months of taking over the local electricity undertaking, the Cannock Urban Council has organised a comprehensive electrical exhibition. It is open for a fortnight and an attractive handbook has been prepared by Mr. H. L. Thomson, M.I.E.E., the local engineer and manager, which presents many interesting phases of the employment of electricity in the home. The exhibition was officially opened on September 15th by Mr. S. T. Allen, M.I.E.E., chief engineer for Central England of the Central Electricity Board, who urged that the attention of the local authority in future should be directed to increasing the sale of units, for the additional cost of electricity purchased would be nothing compared with



The Cannock Electricity Department's Showrooms.

the enormous decrease in the price of the units sold. In Cannock the maximum demand occurred in the daytime, due chiefly to the coal mines, but the domestic demand was not in the daytime. If, therefore, the supply was increased to domestic consumers during the day, the cost would be increased but to a small extent, and, indeed, would be cheaper. Councillor A. Whitehouse, chairman of the Electricity Committee, spoke of the extensive domestic use to which electricity could be put, and expressed the hope that the exhibition, with its accompanying demonstrations, would result in a more general use of such appliances in the district. The showrooms have been attractively set out to display to the best advantage all kinds of appliances for cooking, heating, freezing and washing, and demonstrations of cooking and washing are given daily. The windows of the showrooms are illustrated herewith.

The Ruths Installation at Charlottenburg.

Mr. F. E. Powell, chairman of Ruths Steam Storage, Ltd., and Mr. A. J. T. Taylor, managing director, have just returned from a conference with Dr. Ruths and his engineers in Berlin, and from inspecting the progress made on the Ruths steam accumulator installation at Charlottenburg, the foundations of which are all in. This accumulator installation consists of 16 large vertically arranged steel tanks, 70 ft. high by 15 ft. in diameter, and with a total capacity of 175,000 cu. ft., which provides storage of nearly 70,000 kWh. The installation will form an important link in the chain of power plants supplying Greater Berlin.

Trade Announcements.

MESSRS. YOUNG & WILDSMITH, electrical and radio wholesale distributors, are removing on October 1st to 35, Little Russell Street, New Oxford Street, W.C.1, where they will have showrooms and much larger trade counter facilities.

Messrs. CALLENDER'S CABLE & CONSTRUCTION CO., LTD., announce that their sales office for the London district has been moved from 113-117, Charing Cross Road, to 2, Surrey Street, Strand (Telephone No. "Central 7953"), where a complete supply of rubber cable stocks and accessories is held. The company has taken the whole of these premises and subsequently other departments will be moved there. The registered office and headquarters will remain as hitherto at Hamilton House, Victoria Embankment, E.C.4 (Telephone No. "Central 8903.").

From October 1st the Birmingham office and stores of the MACINTOSH CABLE CO., LTD., will be situated at 26, Livery Street. Telephone: Central 8585; telegrams: "Conductor, Birmingham."

The address of ARUNDELL DISPLAY, LTD., is now Arundell House, Martlett Court, Bow Street, W.C.2. (Telephone: Temple Bar 7202-03.)

Messrs. AUTO-BULBS, LTD., of Hatton Garden, E.C.1, announce that "Sphinx" auto-bulbs, entirely manufactured by them in England, are now available through their usual factors. They state that 10,000 of their Service Cabinet systems containing complete sets of car lamps have now been installed by service garages.

Messrs. J. J. EASTICK & SONS announce that Mr. Brimson, late of Messrs. Houghton-Butcher, has joined their sales staff for Kent; Mr. Geen is covering S.E. and S.W. London, and Mr. F. C. B. Hilton, Buckinghamshire, &c.

Mr. E. E. GARRARD, A.M.I.E.E., of 82, Victoria Street, S.W.1, has been appointed agent in the British Isles and Dominions for the Forges et Ateliers de Constructions Electriques de Jeumont, manufacturers of super-tension and low-tension cables, electrical apparatus and machinery. The company has a capital of £4,000,000.

The address of Messrs. MYLAN & SMITH (ENGINEERS), LTD., is now Bamford, *via* Sheffield. (Telephone: Bamford 25; telegrams: "Topical, Sheffield.")

Considerable extensions are being made to the works of Messrs. J. STONE & CO., LTD., electrical engineers and manufacturers, of Deptford, S.E.

The HOUSE REPAIR SERVICE CO., of Bournemouth West and Parkstone, has opened additional showrooms at 107, Commercial Road, Parkstone. Electrical trade catalogues are asked for.

Employment During August.

The September *Ministry of Labour Gazette* states that employment in the engineering industry continued to decline during August, especially in the motor vehicle and constructional engineering sections, and was very slack on the whole. In electrical engineering, however, conditions remained fair. The statistics show that the number of unemployed in the industry as a whole rose by 8,382 to 100,736 and the proportion from 9.5 to 10.4 per cent. There was an increase of 168 (to 4,168) in the electrical section, raising the proportion of unemployed from 5.1 to 5.4 per cent. In the wiring and contracting industry, however, 58 more men were shown as employed, reducing the number of unemployed to 1,272 and the percentage from 9.3 to 8.9. There was a similar decrease in the electrical cable, wire and lamp manufacturing group—from 4,485 to 4,420—and the proportion of unemployed thus fell from 5.4 to 5.3 per cent.

A Glasgow Exhibition.

Electrical appliances and labour-saving devices occupy a prominent place at Glasgow Corporation's Housing and Health Exhibition opened in the Kelvin Hall on September 19th by the Duchess of Montrose. In the exhibit of the Corporation Electricity Department cookers of the latest types are prominently displayed. Among them are the "Xcel" and the "Falco" models, which can be obtained on hire from the department. Working demonstrations are given at the stand of electric cookers, washing machines, toasters, fires, &c. Another noteworthy stand is that of the Clyde Valley Electrical Power Company. The feature here is a well-appointed kitchen, lounge, and fire room, while demonstrations of cooking by electricity are given. Other exhibitors are: Electro Rays, Ltd. (artificial sunlight apparatus, &c.), Frigidaire, Ltd. (refrigerators and "Delco" lighting plant), Hoover, Ltd., Electrolux, Ltd. (cleaners, refrigerators, water softener, &c.), Carron Company (cooking and heating appliances), Tellus Electric Cleaner Co., F.E. Industrials, Ltd. (labour-saving appliances), Dominion Machine Co., Ltd. (labour-saving machines), W. J. Hannah & Co., Ltd. (sweepers, radio apparatus, &c.), the British Vacuum Cleaner and Engineering Co., Ltd. (cleaners), Hurley Machine Co. (electric washers, ironers, &c.), Electric Appliances Co., Ltd. (vacuum cleaners), and the General Electric Co., Ltd. (electric lighting fittings, &c.). The exhibition remains open till October 13th.

Glasgow's Grant to the Electrical Research Association.

Glasgow Corporation Electricity Committee recommends that a donation of £100 be made to the funds of the British Electrical and Allied Industries Research Association.

The South-Midland E.D.A. Committee.

Members of the South Midland Area Committee of the British Electrical Development Association, accompanied by Lieut.-Col. W. A. Vignoles, director of the Association, and Mr. R. A. Chattock, the Birmingham city electrical engineer, who is also chairman of the Area Committee, last week paid

The South-Midland Area Committee of the B.E.D.A.

a visit to the new head offices of the Shropshire, Worcestershire, and Staffordshire Electric Power Co., at Mucklows Hill, Halesowen. Mr. J. T. H. Legge, chief engineer and manager of the company, was unable to be present, but was represented by Mr. E. E. Hamar, the commercial engineer, who received the guests. After inspecting the offices, members

were entertained to luncheon by the company, and then they held their usual committee meeting in the board room. At this meeting the preliminary arrangements in connection with the Factory and Workshop Lighting Campaign were considered. Before leaving, the company assembled for a group photograph, which is reproduced herewith.

New Catalogues and Lists.

PHILIPS LAMPS, LTD., 145, Charing Cross Road, W.C.2.—A folder containing illustrated details and prices of the company's h.t. radio units and battery chargers.

BRITISH BROWN-BOVERI, LTD., Trafalgar House, Waterloo Place, S.W.1.—A brochure containing illustrations and particulars of scavenging blowers for two-stroke cycle Diesel engines.

THE PRECISION FUSE CO., 203, High Town Road, Luton, Beds.—An illustrated and priced catalogue of indicating cartridge fuses, fuse wire and strip, and clips and terminals.

STERNOL, LTD., Royal London House, Finsbury Square, E.C.2.—A booklet dealing with the care of the Ruston and Hornsby cold-starting heavy-oil engine with special reference to the use of "Sternol" lubricants.

DOMESTIC ELECTRIFICATION, LTD., Townsend House, Greycoat Place, Westminster, S.W.1.—A leaflet illustrating and describing the company's "Type R.C.F." electric fire. Priced.

MESSRS. DONOVAN & CO., Cornwall Street, Birmingham.—List No. 1928, a comprehensive catalogue of electrical accessories, lighting fittings, domestic appliances, electric tools, clocks, &c. Fully illustrated and priced.

MESSRS. JOHN SHAW & SONS (WOLVERHAMPTON), LTD., Wolverhampton.—Illustrated and priced folders dealing respectively with "Trojan" electric lamps and the "20-20" vacuum cleaner.

THE BRITISH THOMSON-HOUSTON CO., LTD., Crown House, Aldwych, W.C.2.—A series of leaflets and particulars relating to the company's lamp campaign.

MESSRS. FALK, STADELMANN & CO., LTD., 83-93, Farringdon Road, E.C.1.—Catalogue 603, containing illustrations, particulars and prices of "Lucifer" portable electric lamps of many patterns.

BRITISH INSULATED CABLES, LTD., Prescot, Lancs.—A document of legal appearance advertising and bearing samples of the company's lead seals for meters, cut-outs, &c. Priced.

THE SUPERHEATER CO., LTD., 195, Strand, W.C.2.—Publication S4, illustrating and describing the company's superheaters for various types of boilers.

THE ELECTRICAL EQUIPMENT & CARBON CO., LTD., 107-111, New Oxford Street, W.C.1.—A leaflet reproducing spectrograms of "Siemens" therapeutic carbons.

THE LONDON RADIO MFG. CO., LTD., Station Road, Merton Abbey, S.W.19.—A leaflet bearing illustrations and prices of the company's portable receiver, loud-speakers, &c.

THE FOSTER ENGINEERING CO., LTD., Morden Works, Wimbledon, S.W.19.—Catalogue 1828—a list of "Apex" switch- and fuse-gear of many types. Illustrated and priced.

ELECTRADIX RADIOS, 218, Upper Thames Street, E.C.4.—Catalogue No. 73, containing particulars and prices of instruments and a large variety of radio apparatus.

MESSRS. EASTICK, Eelix House, 118, Bunhill Row, E.C.—An illustrated and priced leaflet dealing with the firm's standardised radio plugs and sockets.

THE ENTERPRISE MFG. CO., LTD., 83-87, Merton Road, Wimbledon, S.W.19.—An abridged price list (illustrated) of time switches, automatic switches, sign controllers and flashers.

THE PARSONS OIL ENGINE CO., LTD., Southampton.—Publication No. 97-1928, containing illustrated notes upon the company's stationary and portable compressor, pumping and generating sets, internal-combustion locomotives, &c.

BRITISH B.A.G., LTD., 23, Farringdon Avenue, E.C.4.—An illustrated and priced leaflet dealing with the company's toasters and irons.

MESSRS. PHILLIPS & TURNER, Cambridge Street, Birmingham.—A pamphlet describing (with illustrations) the "Tenby" wiring system.

MR. H. S. RIANT, Oxford House, 9-15, Oxford Street, W.1.—An illustrated and priced catalogue of "Straight-Lite" reflectors for cornice and concealed lighting, electric signs, &c.

MESSRS. BELLING & CO., Bridge Works, Enfield.—Catalogue of "Belling" fires of many designs for the 1928-29 season. Fully illustrated and priced.

M.K. ELECTRIC, LTD., Wakefield Street, Edmonton, N.18.—A 64-page catalogue of "M.K." accessories, including distribution boards, switch-plugs of many patterns, tumbler switches, switch plates, cooker control boards, &c. Illustrated and priced.

Social Events.

About 2,500 employés of the REVO ELECTRIC CO., LTD., and its associated enterprises, and their wives assembled in force at "The Field House," Clent, Worcs., on September 1st, to celebrate the recent marriage of Mr. Malcolm S. Vaughan, eldest son of Mr. Ernest Vaughan (the chairman of the company) to Miss Judith Leveson-Gower. There were bowling and tennis tournaments, and a number of side shows. After the various events were finished, handsome presents were distributed to the winning teams and individual competitors by Mrs. Malcolm S. Vaughan, who received a most enthusiastic welcome. During the day the Revo Electric Works Prize Band played selections, and in the evening provided music for community singing.

To celebrate the attainment of their 50th year of business, Messrs. W. H. Willcox & Co., Ltd., on September 15th held a sports meeting and other entertainments at their sports ground, Elmer's End. About 450 employés and friends were conveyed by train to the ground and an excellent programme was provided, including luncheon and tea, sports, concerts, and side-shows.

Metal Trades' Benevolence.

The Royal Metal Trades' Pension and Benevolent Society is organising a draw to raise funds for a special Christmas grant to its pensioners, numbering 265. Particulars are available from the Secretary, 195, Upper Thames Street, E.C.4.

Prices of Materials.

Messrs. F. Smith & Co. report, September 26th:—Copper (electrolytic) bars, £71 15s., 20s. inc.; ditto ditto sheets, no change; ditto ditto wire rods, £81 15s., 20s. inc.; ditto ditto h.c. wire, 10 3/16d., ¼d. inc. Silicium bronze wire, 10¼d., ¼d. inc.

Messrs. James & Shakespeare report, September 26th:—No change in copper and lead prices.

Messrs. Edward Till & Co. report, September 26th:—No change in the price of India-rubber, Para fine.

Reporting on the lead market on September 22nd, Messrs. James Forster & Co. stated:—"Business has been very quiet this week, consumers not evincing much interest in the market. On the other hand, arrivals are few and far between, and this fact has prevented any decline in price. The meeting of lead producers early in the week has left the position very much as they found it. Production is to be curtailed only 'in case of urgent necessity,' which, presumably, means if the price falls below £20 per ton. As the general situation of supply and demand has been steadily improving this year, this seems now very unlikely. The Australian shipping strike is practically settled, so that the position should become more normal again. For the future we cannot see any marked setback in lead; on the other hand, with the expectation of better consumption this autumn and an improving statistical position, a further rise would not be unexpected."

Lighting and Power Notes.

Aylesbury.—LOAN.—The Town Council has applied for a loan of £34,382 for prospective expenditure on mains, services, and other equipment.

Barnsley.—EXTENDED PAYMENTS.—The borough electrical engineer is to prepare a scheme for offering to consumers certain domestic electrical apparatus on a system of extended payments.

Barrow-in-Furness.—YEAR'S WORKING.—The accounts of the electricity undertaking (engineer, Mr. H. R. Burnett) for the year ended March 31st last, show a total revenue of £106,712, as compared with £104,120 for the previous year. The working costs amounted to £61,771, as against £74,046, so that there remains a gross profit of £44,941 (£30,074). The financial result of the working after the deduction of all charges amounts to £14,035, as compared with a deficit of £1,484 for the previous year. The capital expenditure for the year amounted to £17,751, including £7,013 on mains, £3,693 on sub-stations, and £2,475 on services, which brings the total expenditure upon the undertaking up to £436,742. 16,635,404 kWh was sold during the year, and the maximum demand on the undertaking was 5,800 kW. The load factor was 42.09 per cent. The working costs amounted to 0.891d. per kWh generated.

Beckenham.—BULK SUPPLY.—As a result of a comparison of the costs of corresponding supplies on the terms proposed by the Croydon Corporation, through the London and Home Counties Joint Electricity Authority, and by the West Kent Electricity Co., the Electricity Commissioners have decided to refuse their consent to the proposed bulk supply by the Croydon Corporation.

Bedford.—MAINS EXTENSIONS.—The Electricity Committee has authorised mains extensions at a cost of about £1,000.

NEW POWER STATION.—It is reported that powers have been obtained by the Bedfordshire, Cambridgeshire and Huntingdonshire Electricity Co. to compulsorily acquire a site at Little Barford for the erection of a power station.

LOAN.—The Electricity Committee is to seek sanction for a loan of £10,000 for house services.

Bexhill.—YEAR'S WORKING.—The report of the borough electrical engineer, Mr. C. A. Frost, on the working of the electricity undertaking for the year ended March 31st last shows a total income of £35,028, as compared with £35,484 for the previous year. The working expenses amounted to £24,959, against £22,448, leaving a gross profit of £10,069 (£13,036). After the deduction of capital expenses there is a net profit of £252. The capital expenditure during the year amounted to £9,356, including £7,725 for mains and £991 for meters, which brings the total capital expenditure on the undertaking up to £154,081. The energy generated and pur-

chased during the year amounted to 3,493,466 kWh, and 2,685,108 kWh was sold. The maximum demand on the undertaking during the year was 1,917 kW.

MAINS EXTENSIONS.—The Electricity Committee is to extend mains at a cost of £800.

Blackburn.—SPECIAL ORDER.—The Corporation has applied to the Electricity Commissioners for a Special Order authorising it to supply electricity in the parish of Pleasington.

Blyth (Notts.).—VILLAGE SUPPLY.—The village is to be lighted by electricity, Lord Barnby having signed a contract with the Electrical Distribution of Yorkshire, Ltd., for a supply, for which he has made himself responsible.

Bristol.—PRICE REDUCTION.—The Electricity Committee has decided to reduce the charge for lighting from 5½d. to 5d. per kWh.

Canada.—HYDRO-ELECTRIC DEVELOPMENT.—The Dominion Cabinet has ratified the lease to a subsidiary of the Winnipeg Electric Co. of the power rights of the Winnipeg River at Seven Sisters Falls on a 30-year basis. It is estimated that the power to be developed will amount to 1,230,000 h.p.

Cannock.—LIGHTING INSTALLATIONS.—The Urban Council has decided to allow persons who have electric light installations on the hire basis to become purchasers at the end of six years.

PRICE REDUCTION.—Tenants of Council houses having prepayment meters are to have the standing charge reduced by 3d. per week, and the price of electricity reduced by ½d. per kWh.

LOAN.—A loan has been applied for for the extension of the mains to the Penkridge district.

Continental.—PORTUGAL.—A proposal to use the falls on the Zezere River, a tributary of the Tagus, for hydro-electric purposes is being studied by the Minister of Commerce. It is estimated that the power available would save the £437,000 spent annually on British coal.

Croydon.—MAINS EXTENSIONS.—The Electricity Committee has authorised mains extensions at a cost of £4,350 for the supply to new housing estates now in course of development.

LOAN.—The Electricity Committee has received sanction to borrow £50,000 for mains.

Derby.—RELIEF OF RATES.—The Electricity Committee proposes to hand over £6,000 from the profits for the relief of rates.

Falkirk.—YEAR'S WORKING.—The abstract of the accounts of the electricity undertaking (engineer, Mr. T. M. Climie) for the year ended May 15th last, shows a total revenue of £39,277, as compared with £37,917 for the previous year. The working expenses amounted to £26,880, against £25,160, leaving a gross profit of £12,397 (£12,757). After the deduction of the capital expenses there is a net surplus of £222, as compared with £616 for the preceding year. The capital expenditure during the year amounted to £737, bringing the total for the undertaking up to £165,333. 6,566,600 kWh was generated during the year, and the maximum demand on the undertaking was 3,100 kW.

PRICE REDUCTIONS.—Considerable reductions are to be made in the electricity charges as from October. Some of the new rates will be: Large power consumers, from 0.5d. to 0.3d. per unit, according to consumption; small power, from 2½d. (M.D.) to 1½d. per unit; lighting, 3½d. per kWh; domestic lighting and heating, first 40 units per room at lighting rates, plus 1d. per unit thereafter; special heating and cooking rate, 30s. per annum, plus 1d. per unit.

Glasgow.—CENTRAL SCOTLAND SCHEME.—The Central Electricity Board has approved the works to be carried out by the Corporation under the Central Scotland scheme, with the exception of the main transformers of No. 5 alternator at Dalmarnock power station, work on which is to be held in abeyance pending a trial of the existing transformers.

MAINS EXTENSIONS.—The Electricity Committee has recommended mains extensions at a cost of about £5,000.

Grampian Scheme.—WORK COMMENCED.—Work in connection with the linking up of Montrose with the Grampian electricity scheme was commenced on September 18th—when a start was made with the laying of the underground cable from the vicinity of the power station to the Brechin Road.

Grimsby.—LOAN.—The Electricity Committee is seeking sanction for a loan of £1,400 for the supply of electricity to the Yarborough Road district.

Inverness.—PUBLIC LIGHTING.—The streets of the capital of the Highlands were lighted by electricity for the first time last week.

Iraq.—BAGHDAD.—A 16-year-old controversy concerning the Baghdad electric lighting and tramway scheme came to a close during a recent debate of the Chamber of Deputies, resulting in a big majority in favour of granting the concession to a British syndicate. The concession was originally granted by the Ottoman Government, before the War, to a Turkish subject, who opened negotiations with a London group of financiers.

Japan.—HYDRO-ELECTRIC PROJECTS.—The Aka-gawa Hydro-Electric Co., Ltd., has applied to the Government for permission to develop electricity at two points on the Tadami River; the scheme provides for two power stations of 15,000 and 19,000 kW, respectively

Leeward Islands.—STORM DAMAGE.—As a result of a tornado early this month the electric lighting systems at St. Christopher (St. Kitts) and Roseau (Dominica) have been seriously damaged.

London.—ST. PANCRAS.—*Loans.*—The Electricity Committeee has obtained sanction to loans of £4,833 for switchgear at King's Road and Regent's Park sub-stations, and £1,440 for a new l.p. main from Tavistock Place sub-station to Upper Bedford Place. The Committee is also seeking sanction to a loan of £1,200 for the installation of a distribution kiosk for the supply to the L.C.C. dwellings in the Ossulton Street area.

STOKE NEWINGTON.—*Assisted Wiring.*—The Electricity Committee has agreed to install free wiring in 86 premises, at an estimated cost of £862.

ISLINGTON.—*Loans.*—The Electricity Committee has obtained sanction to loans of £20,000 for mains and £35,000 for sub-station equipment and switchgear. Sanction is expected to a loan of £12,000 for the purchase of sites and the erection of sub-stations when the Electricity Commissioners have details of the proposals.

HACKNEY.—*Street Lighting Costs.*—A report by the borough treasurer on the street lighting costs shows that for 1927-28 electric lighting costs of £15,604 represents a saving of £3,449 on the charges which would have been made had not conversion from gas to electricity been made.

The Electricity Committee has recommended that a scheme for the installation of one 30,000-kW set, at an estimated cost of £460,000, be submitted to the Central Electricity Board, the Electricity Commissioners, and the London and Home Counties' Joint Electricity Authority. This estimate includes the cost of buildings, &c., sufficient for the housing of a second set of 30,000 kW.

BATTERSEA.—*Two-part Tariff.*—The Electricity Committee has recommended that a two-part tariff be adopted for premises separately rated, as an alternative to the present flat rate charges, the fixed charge to be 12½ per cent. per annum on the ratable value, and the unit charge ¾d.

Mains Extensions.—The Committee has recommended that mains be laid in certain selected streets for private consumers and public lighting at an estimated cost of £24,421.

New Set Sanctioned.—The Electricity Commissioners have consented to the installation of a new 30,000-kW set and boiler plant at the generating station.

Penang.—GEORGE TOWN.—The annual report for the year 1927 on the working of the municipal electricity supply department (engineer: Mr. T. Rogers, M.I.E.E.) shows an income of £139,088, and total working expenses of £78,150, leaving a gross profit of £60,930. Deduction of capital expenses, &c., leaves a net profit of £23,078. The capital expenditure during the year amounted to £105,637, including £43,196 for mains, £33,994 for machinery, and £15,279 for motors. The units sold during the year amounted to 9,583,048, an increase of 13.07 per cent. on the figure for the previous year. The fuel cost per unit sold amounted to 0.81d. The maximum loads on the Prai and Sungei Pinang stations during the year were 2,969 kW and 3,250 kW, respectively. A new 5,000-kW set is being installed in the latter station, which, when completed, should make it unnecessary to run the Prai station until the load increases.

Penzance.—NEW SUB-STATION.—The Cornwall Electric Power Co. is to erect a sub-station in Albert Street, Penzance.

Peru.—WATER POWER.—Government surveys show that over 4,000 different sites exist in Peru where 10,000 h.p. could be developed by building 10 to 15 miles of canals. The Government intends gradually to utilise the abundant potential power by State and private enterprise, and it is therefore thought that a good market for machinery and appliances will shortly present itself.

Preston.—PRICE REDUCTIONS.—The Electricity Committee has decided to make substantial concessions to electricity consumers. One proposal is to reduce shop window lighting from 4d. to 3d. per kWh less 5 per cent., and to make the flat-rate tariff charge 6d. instead of 6½d. per kWh. The home system of charging each evening will be reduced by about 25 per cent. Current consumed will be charged for at from ¾d. to ½d. per kWh, according to consumption.

South Africa.—CAPE TOWN.—The Electricity Committee is to lay mains in the Plumstead district at a cost of about £1,000.

Southampton.—YEAR'S WORKING.—The annual report and abstract of accounts of the electricity undertaking (engineer: Mr. W. G. Turner) for the year ended March 31st last, show a total income of £221,641, as compared with £220,321 for the previous year. The working expenses amounted to £116,689, against £136,522, leaving a gross balance of £104,952 (£83,799). The net revenue account shows a net profit of £41,421, as compared with £27,580 for the preceding year. The capital expenditure during the year amounted to £94,238, and included £54,455 spent on mains. The total capital expenditure on the undertaking now stands at £1,047,256. The energy sold during the year amounted to 26,487,488 kWh, and the maximum demand on the undertaking was 15,420 kW, an increase of 28 per cent. on the load for the previous year. The load factor for the year was 24.7 per cent., a decrease of 12.7 per cent. The working expenses per unit sold amounted to 1.057d.

Swansea.—MAINS EXTENSIONS.—Considerable mains extensions are projected by the Electricity Committee, involving the expenditure of between £40,000 or £50,000.

Tiverton.—VILLAGE LIGHTING.—The Rural District Council has accepted the tender of the Bradninch Company for the lighting of the village by electricity.

Wickford (Essex).—PLANT EXTENSIONS.—The Wickford Electrical Supply Co. recently inaugurated its new generating plant, which consists of a 90-h.p. Petter crude oil engine coupled to a 500-V 60-kW Crompton generator.

Wyre.—OVERHEAD MAINS.—The Parish Council has withdrawn its opposition to the use of overhead mains by the Shropshire, Worcestershire and Staffordshire Electric Power Co. for the supply of electricity to the parish.

Tramway and Railway Notes.

Aberdeen.—YEAR'S WORKING.—We have received from Mr. Wm. Forbes, M.Inst.T., general manager, a copy of the report any analysis of receipts and expenses of the Tramways Department for the year ended May 31st last. The revenue account for the tramways shows a total income of £153,267, as compared with £143,906 for the previous year, and total working expenses of £125,263, against £117,577, leaving a gross balance of £28,004 (£26,329) for transfer to the net revenue account. This shows, after the deduction of capital expenses and contributions to sinking fund, &c., a net profit of £6,184, as compared with £1,240 for the year 1926-7. For the motor-'buses the total revenue shown is £65,754, as compared with £51,562 for the preceding year. The working expenses amounted to £49,521, against £43,759, leaving a gross profit of £16,233 (£7,803). The net profit for the year is shown as £5,205, against £3,682 for 1926-7. The capital expenditure for the year for the whole department amounted to £13,257, which included £9,790 for a new garage at Canal Road. 39,557,263 passengers were carried on the tramcars and 13,380,145 on the 'buses. The tramway car mileage for the year totalled 2,702,548, an increase of 5.37 per cent., and the 'bus mileage amounted to 1,309,461, an increase of 22.10 per cent. The average cost of electrical energy for the tramways is shown as 1.038d. per kWh, and 1.708d. per car mile.

Glasgow.—GRANT TO EMPLOYÉ.—The Tramways Committee has recommended a grant of £50 to Mr. William Peacock, foreman bodymaker at the Coplawhill car works, for an improved construction of composite framing of the side walls of tramway vehicles, and for other improvements in connection with the construction of tramcars.

Liverpool.—NEW WORKS.—Col. Ashley, Minister of Transport, will next month open the new works of the Corporation tramway department, which have been built at a cost of £400,000.

Penang. — GEORGE TOWN. — The annual report for the year 1927 on the working of the municipal tramway department (manager: Mr. T. Rogers, M.I.E.E.) shows an income of £34,989, and working expenses of £26,583, leaving a gross profit of £8,406. The net profit shown after the deduction of capital expenses is £1,482. The capital expenditure during the year amounted to £17,571, including £7,761 for electrical equipment of line and £5,414 for rolling stock (railless). The number of passengers carried during the year was 8,468,368, against 8,465,821 for the previous year. The above figures cover both the tramcars and motor-'buses. The energy used by the tramways totalled 462,478 kWh, for a total car mileage of 511,223.

Southend-on-Sea.—LOAN.—The Town Council has decided to apply for a loan of £22,500 for extending the loops to the central passing place on the Pier electric tramway, a total distance of 908 yards.

Sunderland.—NEW DEPÔT.—The Town Council is to purchase for £16,000 premises in Fulwell Road for use as a tramcar and 'bus depot.

Telegraph and Telephone Notes.

France.—AUTOMATIC TELEPHONY.—Part of the City of Paris is now using for the first time a rotary automatic telephone system. The opening of the Carnot exchange on September 22nd marked the first step in the conversion of all the telephones in France's capital to dial working. The programme, extending over ten years, has been mapped out for conversion to the rotary automatic system, which has been developed by the International Telephone and Telegraph Corporation, and is in extensive use in Spain, Belgium, Holland, Switzerland, and other countries. The Carnot exchange contains equipment for 6,000 subscribers' lines.

International Telegraph Congress.—CODE WORDING.—The International Telegraph Conference held a plenary session on September 20th at Brussels, and accepted a compromise whereby two systems will be authorised with regard to the wording of code telegrams: that of 10-letter words at the present rates, and that of five-letter words at reduced rates. The latter system permits all possible combinations of vowels or consonants in code words, says *The Times*. The proposal was approved by 46 of the countries represented; four countries did not vote.

It has been unanimously decided that the next conference shall be held at Madrid, Spain.

Leeward Islands.—STORM DAMAGE.—A tornado early this month destroyed the telephone exchange and lines throughout the island of Montserrat. The systems at St. Christopher (St. Kitts) and Nevis also suffered, while country lines at Roseau (Dominica) were demolished.

P.T.T.I.—CONGRESS.—A Congress of the Postal, Telegraph and Telephone International has recently been held in London. Mr. J. W. Bowen represented Great Britain and Herr Steinkopf spoke for the German delegation.

Russia. — RADIO-TELEGRAPHY. — Plans for early radio-telegraph communication between the United States and Soviet Russia were announced by Mr. G. Gurevitch, acting chairman of the board of directors of the Amtorg Trading Corporation, New York City, in discussing an agreement recently made between the Radio Corporation of America and the Soviet State Electrotechnical Trust of Weak Current Factories, calling for technical co-operation and exchanges of patent and engineering information between the two organisations. The Amtorg Corporation has also placed a large order for radio equipment in the United States, he said. The Soviet State Weak Current Trust operates the principal factories in the Soviet Union producing telegraph, telephone and radio equipment.

Spain. — AUTOMATIC TELEPHONY. — Barcelano has been equipped with automatic telephones, and has been linked up with Madrid and 19 other cities situated in all parts of Spain through a modern toll switchboard. The new system was inaugurated on September 16th. Barcelona is the seventh Spanish city in the programme of the Compania Telefonica Nacional De Espana to convert nineteen cities to the automatic system in two years. The rotary type of automatic plant has been installed by Standard Telephones & Cables, Ltd., consisting of twenty-six thousand lines located in four specially constructed telephone buildings which were instantly made available for service on seventeen thousand three hundred lines with a total of twenty-three thousand seven hundred and fifty telephones connected. Long-distance communication in Spain is considered to be of the greatest importance by the Spanish Government and Spanish business men; 3,500 miles of toll circuit are employed, and 18 repeaters have been installed for the amplification of speech.

Radio Notes.

B.B.C.—FINANCE.—The bulk of the B.B.C.'s income comes from the Post Office, based on the number of receiving licences issued. Of all fees collected, 12½ per cent. is retained by the Post Office to cover costs of collection and administration. Then, in respect of the first million licences issued, the Treasury retains a further 10 per cent.; in respect of the second million, 20 per cent.; of the third, 30 per cent.; of anything over three millions, 40 per cent. According to *The Times*, for the financial year ended March 31st, 1928, the actual division of licence fees collected during the year was as follows: retained by Post Office, £141,875; retained by Treasury, £192,166; paid to B.B.C., £800,959; total, £1,135,000. The revenue account for the year ended December 31st, 1927, shows among the items on the expenditure side: programmes, &c. (including costs of artists, orchestras, news, royalties, performing rights and simultaneous broadcast telephone system, and salaries of programme staff), £487,728; maintenance of plant, power, salaries and expenses of engineering staff, development and research, &c., £131,036. The balance, being the net revenue for the year, was £128,336. The income was £901,626, made up of licence income £800,959; net revenue from publications, £93,686; and interest and sundry receipts, £6,980. The net revenue for the year was appropriated as follows: £100,000 to capital expenditure to be incurred in the construction and equipment of regional stations, and £10,108 for other capital expenditure incurred during the year; the balance of £18,228 was carried forward.

Mexico.—NEW STATION.—The Mexican Legation has informed *World-Radio* that a new transmitting station has been opened at San Lazaro, a suburb of Mexico City, to broadcast Mexican news, and it is stated that it is sufficiently powerful to ensure reception throughout Europe. The times of transmission will be 9 a.m. and 9 p.m. daily on a wavelength of 44 metres. The call sign of the station is XC51.

Russia.—DEVELOPMENT.—Intensive development of radio communication is expected in Russia, where 67 broadcasting stations and 250,000 receiving sets are claimed to be in use.

Contract Information.

When "Contracts Open" are advertised in our "Official Notice" pages, the date of the ELECTRICAL REVIEW containing the advertisement is given in parentheses below.

Contracts Open.

Australia.—MELBOURNE.—Posts and Telegraphs Department. October 30th. Loading coil pots.
October 23rd. Insulated wire. (B.X. 4674.)*
October 2nd. Switchboard jacks. (B.X. 4750.)*
November 13th. Switchboard keys and parts. (B.X. 4752.)*
November 20th. Relays. (B.X. 4729.)*
October 26th. City Council. Totally enclosed metal-clad switchgear. (B.X. 4698.)*
October 3rd. Ten 1,500-kVA and four 500-kVA three-phase transformers. (B.X. 4754.)*
November 14th. Totally enclosed metal-clad type switchgear and spares. (B.X. 4748.)*
VICTORIAN ELECTRICITY COMMISSION.—December 17th. Supply of metal-clad switchgear and accessories. (Spec. 28/68, £1 1s. for three copies.)

Bradford.—October 6th. City Council. Electrical installation at the City Hospital, Leeds Road. City architect, Town Hall.

Darlington.—October 15th. Electricity Department. Cooling tower.

Edinburgh.—October 15th. Corporation. Coal and ash plant for Portobello power station. (September 7th.)

Egypt.—Ministry of the Interior. November 10th. Supply and installation of a distribution network for the village of Kena. (B.X. 4707.)*

India.—October 16th. India Store Department. Oil-engine-driven alternator sets and switchgear for Ahmednagar. (B.X. 4714.)*
October 11th. One push-button control passenger lift. (A.X. 6845.)*
October 11th. Two 150-kVA transformers. (September 21st.)
November 2nd. Three 75-kW oil engine alternator sets, water-cooling plant, tanks, switchboard cables, &c. (September 21st.)
October 17th. One water turbine and two oil-driven d.c. generating sets for the Mardan power station. (A.X. 4733.)*

Isleworth.—Board of Guardians. Installation of an intercommunication telephone at the Institution. (See this issue.)

Leicester.—October 8th. Sewage Works and Farms Committee. Electric lighting installation for the Abbey Pumping Station. (See this issue.)

London.—METROPOLITAN ASYLUMS BOARD.—October 3rd. Installation of automatic telephones at Princess Mary's Hospital. Installation of kinematograph at Darenth Training Colony. Wiring of outside supply at Colindale Hospital. (September 7th.)
SOUTHWARK.—October 23rd. Electricity Department. Electric cable for 12 months. (September 14th.)
ISLINGTON.—October 8th. Cleansing Committee. Two new lead batteries for refuse collecting vehicles. (September 21st.)
PADDINGTON.—October 9th. Great Western Railway. Stores, including telegraph instruments, electrical apparatus and electric lamps. (September 21st.)

New Zealand.—WELLINGTON.—November 27th. Public Works Department. Generators and water turbines, in connection with Section 1 of the Waitaki power scheme. (B.X. 4677.)*

Norwich.—October 8th. Electricity Department. 12,500-kW turbo-generator and condensing plant. (September 14th.)

Rumania.—CONSTANZA.—Port Authority. October 1st. One electric portal crane and two goods lifts. (A.X. 6797.)*

Sidmouth.—October 11th. Urban District Council. L.p. overhead mains from the works to Sidford, about one and a half miles. Details from the engineer and manager, Mr. Henry Burgess.

South Africa.—JOHANNESBURG.—Electricity Supply Commission. October 26th. Equipment for a hydro-electric power station, Gordon's Bay hydro-electric scheme, and two outdoor sub-stations. (*a*) Waterwheels; (*b*) generators; (*c*) switchgear, relays, cables, &c.; (*d*) outdoor sub-station steel structure, switchgear and copper; (*e*) miscellaneous equipment, including precision instruments, small petrol-driven generator set, oil filter, &c.
November 9th. Posts and Telegraphs Department. Wall telephones for the Hillbrow exchange. (B.X. 4709.)*
November 15th. Dry cells and voltoids. (B.X. 4729.)*
November 8th. South African Railways and Harbours. Electrically-driven overhead travelling cranes for Pretoria and Pietermaritzburg workshops. (A.X. 6815.)*
PORT ELIZABETH.—October 11th. City Council. Electricity meters, demand indicators, and time switches. (B.X. 4756.)* Cables and wires. (B.X. 4755.)*
October 25th. Transformers. (B.X. 4760.)*
DURBAN.—October 26th. Corporation. Ten single-phase and two three-phase transformers for Alice Street power station. (B.X. 4761-2.)*

Uruguay.—MONTEVIDEO.—State Electricity Supply Works. October 17th. Automatic voltage regulator. (B.X. 4699.)*
October 15th. Electricians' pliers and wire drawing machines. (B.X. 4702.)*

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed.

Australia.—SYDNEY.—With further reference to our note on page 486, ELEC. REV., September 21st, a *Reuter* dispatch states that the New South Wales Executive Council has not approved the tender of Messrs. Babcock & Wilcox for six boilers for the Ultimo power house, at a cost of £261,000, which was recently accepted by the railway authorities. The tender has been referred back to the Railway Commissioners, and in the meantime the Cabinet will scrutinise other tenders. It is now reported that the tender of International Combustion, Ltd., is the lowest.

Glasgow.—Housing Committee. Recommended:—
Electrical installations at Crossloan Road and Kepochill Road housing estates (£447).—R. J. M'Intyre.
Electricity Committee. Recommended:—
Reconditioning alternator switch at Dalmarnock power station (£2,132).—A. Reyrolle & Co., Ltd.

Government Contracts.—The following contracts were placed by Government Departments during August:—

ADMIRALTY (Contract and Purchase Department).

Motor alternators.—Newton Bros. (Derby), Ltd.
Batteries.—D.P. Battery Co., Ltd.; Chloride Electrical Storage Co., Ltd.; Tudor Accumulator Co., Ltd.
Cables.—Greenwich Cable Works, Ltd.; Anchor Cable Co., Ltd.; British Insulated Cables, Ltd.; Enfield Cable Works, Ltd.; General Electric Co., Ltd.; W. T. Henley's Telegraph Works Co., Ltd.; Hooper's Telegraph and I.R. Works, Ltd.; Johnson & Phillips, Ltd.; St. Helens Cable & Rubber Co., Ltd.; Siemens Bros. and Co., Ltd.
Motor generator sets and balancer.—Crompton Parkinson, Ltd.
Motor generators.—Newton Bros. (Derby), Ltd.
Lamp fittings.—Engineering & Lighting Equipment Co., Ltd.; Gabriel & Co.; W. McGeoch & Co., Ltd.; Player and Mitchell.
Electric lamps.—General Electric Co., Ltd.; Siemens Electric Lamps & Supplies, Ltd.
Oscillators.—General Electric Co., Ltd.
Electric welding plant.—G. D. Peters & Co., Ltd.
W/T valves.—General Electric Co., Ltd.

WAR OFFICE.

Electric bulbs.—A. C. Cossor, Ltd.
Electric cable.—Johnson & Phillips, Ltd.
Portable secondary cells.—Chloride Electrical Storage Co., Ltd.; Pritchett & Gold & E.P.S. Co., Ltd.
Electric cords.—Enfield Cable Works, Ltd.
Generating set spares.—Douglas Motors, Ltd.
Electric meters.—Measurement, Ltd.; General Electric Co., Ltd.; Ferranti, Ltd.
E.L. switches.—J. H. Tucker & Co., Ltd.
W/T valves.—General Electric Co., Ltd.

AIR MINISTRY.

Internal wiring (Boscombe Down).—Malcolm & Allen, Ltd.
Generators.—British Thomson-Houston Co., Ltd.; W. Mackie & Co., Ltd.
Generating sets.—Tangyes, Ltd.
Electric lamps.—General Electric Co., Ltd.
Sparking plugs.—Lodge Plugs, Ltd.
Switches.—A. W. Hart & Co.
Telephone receivers and spares.—Telephone Mfg. Co., Ltd.
Transmitter T.22 and spares.—Gambrell Bros., Ltd.

POST OFFICE.

Miscellaneous apparatus.—Chamberlain & Hookham, Ltd.; Phœnix Telephone & Electric Works, Ltd.; Power Equipment Co., Ltd.; E. Turner.
Telephone apparatus.—Automatic Telephone Mfg. Co., Ltd.; Ericsson Telephones, Ltd.; International Electric Co., Ltd.; Phœnix Telephone & Electric Works, Ltd.; Siemens Bros. & Co., Ltd.; Standard Telephones and Cables, Ltd.; Sterling Telephone & Electric Co., Ltd.; Telephone Mfg. Co., Ltd.
Cable (various).—British Insulated Cables, Ltd.; Enfield Cable Works, Ltd.; W. T. Glover & Co., Ltd.; Johnson & Phillips, Ltd.; Standard Telephones & Cables, Ltd.
Lamp caps.—B. W. Johnson.
Cords for telephones.—Phœnix Telephone & Electric Works, Ltd.; Reliance Electrical Wire Co.; Standard Telephones & Cables, Ltd.
Ducts.—Albion Clay Co., Ltd.; Donington Sanitary Pipe and Brick Co., Ltd.; Doulton & Co., Ltd.; Hepworth Iron Co., Ltd.; H. R. Mansfield, Ltd.; J. Oakes & Co. (Riddings Collieries), Ltd.; Oates & Green, Ltd.; Standard Brick & Terra Cotta Co., Ltd.; Stanley Bros., Ltd.; Sutton & Co. (Overseal), Ltd.; Sykes and Son; J. Woodward.
Generators.—Plessey Co., Ltd.; Sterling Telephone and Electric Co., Ltd.
Insulators.—C. W. Outram & Co.
Telegraphic ironwork.—Bayliss, Jones & Bayliss, Ltd.; Bert Birks & Co.; Bullers, Ltd.; T. W. Lench, Ltd.; C. Richards & Sons, Ltd.
Electric lamps.—British Thomson-Houston Co., Ltd.; Cryselco, Ltd.; Edison Swan Electric Co., Ltd.; General Electric Co., Ltd.; Metro-Vick Supplies, Ltd.; Siemens Electric Lamps & Supplies, Ltd.
Lead sleeves.—G. Farmiloe & Sons, Ltd.
Switches.—J. H. Tucker & Co., Ltd.
Bronze insulated wire.—Siemens Bros. & Co., Ltd.
Cadmium copper wire.—Whitecross Co., Ltd.
G.I. strand wire.—Shropshire Iron Co., Ltd.
Manufacture, supply, laying and jointing land and submarine cable.—Anglo-Irish (Blackpool-Port Erin section), Siemens Bros. & Co., Ltd.
Telephone exchange equipment.—Crewe (Crewe multi-exchange area): Ericsson Telephones, Ltd. Sub-contractors: Crompton-Parkinson, Ltd., for charging machines; Newton Bros. (Derby), Ltd., for ringing machines; Chloride Electrical Storage Co., Ltd., for batteries. Nantwich: Ericsson Telephones, Ltd. Sub-contractors: W. Jones & Co. for ringing machines. Smethwick: Ericsson Telephones, Ltd. Cambridge, Bournemouth, and Norwich: Standard Telephones and Cables, Ltd. Livingstone: Siemens Bros. & Co., Ltd. Sub-contractors: English Electric Co., Ltd., for charging machines; Crompton Parkinson, Ltd., for ringing machines; Pritchett & Gold & E.P.S. Co., Ltd., for batteries. West Bromwich and Wednesbury: Siemens Bros. & Co., Ltd. Parkstone (Dorset): General Electric Co., Ltd. Sub-contractors: Crompton Parkinson, Ltd., for machines; Chloride Electrical Storage Co., Ltd., for batteries. Exeter: General Electric Co., Ltd.
Temporary cord circuit repeater equipment.—Manchester: Standard Telephones & Cables, Ltd.

CROWN AGENTS FOR THE COLONIES.

Cables.—Siemens Bros. & Co., Ltd.
Condensing plant.—Ledward & Beckett, Ltd.
Copper wire.—Elliotts Metal Co., Ltd.
Electrical crane equipment.—Craven Bros. (Manchester), Ltd.
Electrical material.—Belliss & Morcom, Ltd.
Generating plant.—Crossley Bros. & Co., Ltd.
Insulators.—Bullers, Ltd.
Meters.—Ferranti, Ltd.
Pump and dynamo.—Marshall, Sons, & Co., Ltd.
Telephones.—Ericsson Telephones, Ltd.
Transformer kiosks.—Johnson & Phillips, Ltd.
Turbo-alternator.—British Thomson-Houston Co., Ltd.
X-ray apparatus.—Watson & Sons (Electro-Medical), Ltd.

H.M. OFFICE OF WORKS.

Wiring Imperial College of Science.—Electrical Installations, Ltd.

Dundee.—The Electricity Committee last week accepted a foreign tender for cable amounting to £1,967. The lowest British tender was £2,295.

Guildford.—Electricity Committee. Accepted :—
Sub-station switchgear :—

CROMPTON PARKINSON, LTD. (accepted) ...	£2,711
Switchgear & Cowans, Ltd.	3,121
General Electric Co., Ltd....	3,539
English Electric Co., Ltd.	3,539
New Switchgear Construction Co., Ltd. ...	3,581
Ferguson, Pailin, Ltd.	3,590

Extension of switchboard at central sub-station (£252).—New Switchgear Construction Co., Ltd.
Five transformer kiosks :—
W. LUCY & Co., LTD., Oxford (accepted) ... £670

Brighton.—Electricity Committee. Accepted :—
1,600 yards e.h.p. cable (£1,127).—Siemens Bros. & Co., Ltd.
6,000 yards l.p. cable (£2,616).—W. T. Glover & Co., Ltd.

Irish Free State.—DUBLIN.—Department of Posts and Telegraphs.
Cable.—Dr. Cassirer & Co.
Cells (porous).—General Electric Co., Ltd.
Instrument cords.—Kromberg & Schubert.
Insulators.—H. Price & Co.
Protectors.—Phœnix Telephone & Electric Works, Ltd.
Relay parts.—Standard Telephones & Cables, Ltd.
Weldless steel tubes.—British Mannesman Tube Co.
G.I. wire.—W. F. Dennis & Co.
Copper wire.—Allgemeine Elektricitäts Gesellschaft.
—*Irish Electrician.*

Leicester.—Electricity Committee. Accepted :—
Provision and installation of complete grit arresting plant at central generating station :—
Grit arrestors for eight boilers (£9,344); eight forced draught fans (£1,144).—Davidson & Co., Ltd.
Sixteen motors and starters for forced and induced draught fans (£3,538).—English Electric Co., Ltd.

London.—ISLINGTON.—Cleansing Committee. Accepted :—
Battery for electric vehicle (£154).—D.P. Battery Co., Ltd.

Southampton.—Town Council. Accepted :—
Electrical equipment in connection with the supply of electricity to Newtown, Netley, and Hamble (£3,984).—Pirelli-General Cable Works, Ltd.

Southend-on-Sea.—Town Council. Accepted :—
Eight generator coils for the 300-kW set (£180).—Crompton Parkinson, Ltd.
Necessary plant in connection with the bulk supply (£959).—General Electric Co., Ltd.

Whitehaven.—Accepted :—
Electric lighting installation for the Wesleyan Church, Thornhill.—T. S. Bell & Co.

Workington.—Accepted :—
Electric lighting installation for St. Michael's church.—T. S. Bell & Co.

Forthcoming Events.

Fuel Conference.—September 24th-October 6th. Imperial Institute, S.W.

Birmingham Electric Club.—Friday, September 28th. Grand Hotel. 7 p.m. "Automatic Sub-stations." Mr. G. Rogers.

Society of Engineers.—Monday, October 1st. Burlington House, W. 6 p.m. "Pulverised Fuel in Theory and Practice." Dr. G. E .K. Blythe.

Association of Supervising Electrical Engineers.—Tuesday, October 2nd. Junior Institution of Engineers. 39, Victoria Street, S.W. 7.15 p.m. Presidential address by Mr. S. B. Donkin.

Electrical Society of Glasgow.—Tuesday, October 2nd. 34, Gordon Street, Glasgow. 7.30 p.m. "Research Applied to Electrical Engineering." Mr. W. Wilson.

Junior Institution of Engineers.—Friday, October 5th. 39, Victoria Street, S.W. 7.30 p.m. Open meeting. Lecture. "Interesting Details of Swiss Alpine Railways." Mr. A. J. Simpson.

British Electrical Development Association. — Friday, October 5th. Factory and Workshop Lighting Campaign. Sales Conference and Demonstration. Lighting Service Bureau, 15, Savoy Street, W.C. 7.30 p.m.

Electrical Power Engineers' Association.—Saturday, October 6th. Hotel Cecil, Strand, W.C. 5.30 for 6 p.m. Annual dinner.

The "Electrical Review" Service Department.

INQUIRIES must be accompanied by a stamped addressed envelope.

We should be glad to learn the names and addresses of makers of the following :—

WILLEY portable electric drill.
CARLTON arc lamp.
Repairers of electric geysers.
PERFECTA motor starter for use with d.c. motors.

Notes.

The Oil Tanker "Brunswick."

In our last issue, under the heading of "A Diesel-Electric Ship," we published a description of the electrical equipment of the new 17,680-ton oil tanker which has been built for the Atlantic Refining Co., of Philadelphia. It should have been mentioned that the British Thomson-Houston Co., Ltd., of Rugby, was responsible for the electrical propulsion equipment, and also the auxiliary motors and the electrical control gear for all services.

E.A.W. Activities.

A North Wales branch of the Electrical Association for Women is to be formed early in October. Two meetings will be held, one at the Church House, Wrexham, on October 5th, and one at the Town Hall, Llandudno, on October 6th, and will be addressed by Dr. S. Z. de Ferranti. Miss Haslett, director of the Association, will take the chair.

The London fixtures of the Association for the autumn and winter, 1928, include the following visits and lectures: October 3rd, visit to the model dairies of the London Wholesale Dairies, Ltd.; November 7th, lecture by Mr. E. E. Hoadley, M.I.E.E. (Maidstone), on "The Electricity Supply Act, 1926"; November 21st, lecture on "Electric Cooking Methods," by Mrs. E. M. Barnett; November 28th, "The Commonsense Handling of Domestic Electrical Equipment," by Mr. R. W. Kennedy; December 5th, "Domestic Electric Water Heating in Old and New Houses," by Mr. S. C. Hurry; December 17th, visit to the new showrooms of the Battersea electricity undertaking.

The opening meeting of the 1928-29 session of the Manchester District Branch of the Association will take place on October 4th. Mr. Llewelyn B. Atkinson (past-president, I.E.E.) and Lt.-Col. W. A. Vignoles (director, E.D.A.) will address the meeting. The programme for the session provides for some interesting lectures and visits, the latter including the Salford electricity showrooms and Barton power station.

Meter Engineers and I.E.E.

As a result of certain tentative suggestions put forward some time ago, negotiations have been proceeding between the Meter Engineers' Technical Association and the Institution of Electrical Engineers with a view to arriving at a basis upon which to found definite proposals for some form of nexus between the two bodies. As a consequence the M.E.T.A. has been honoured by an invitation from the I.E.E. to co-operate with it in the formation of a new section of the Institution, to be called the "Meter and Instrument Section," and definite proposals, deemed to be acceptable to both negotiating parties, have been formulated. The proposals involve, as a necessary initial step, the dissolution of the Meter Engineers' Technical Association as such, and the formation instead of a new Meter and Instrument Section of the Institution. Members of the M.E.T.A. who already belong to the I.E.E., and those who will be subsequently elected from the M.E.T.A. membership, will form the nucleus of the section. A ballot of the members of the M.E.T.A. disclosed a substantial majority in favour of the proposals, and the Council decided upon December 31st next as the date for the dissolution to take effect. In view of the impending dissolution no further applications for membership or transfer will be considered, but applicants are being recommended to join the I.E.E. so as to become qualified for membership of the new section. The M.E.T.A. Council's judgment of the position was influenced particularly by consideration of the desirability of avoiding the maintenance of separate associations whose objects are comprehended within those of the parent Institution.

Fatality.

An inquest was held at Birmingham on September 20th, on William Kite (75), a journeyman electrician, who received a fatal electric shock while following his employment at Messrs. Marsh & Baxter's premises. On Tuesday morning Mr. W. Humphries (manager) said Kite was called to examine an electric lift which was installed in June last by Messrs. Holt & Willetts. It had been satisfactory, but on this particular morning was said to be sparking. A little later he was informed that Kite had received an electric shock and efforts to restore him had failed. Later, the factory inspector discovered a defect in the gate lock, which was not properly earthed. Messrs. Holt & Willetts said their representative usually notified the Corporation of the completion of a job, and requested the usual inspection, but in this case it was not done. An inspector of the Electricity Supply Department stated that the first thing he looked for was the earthing of the lock and found that none had been provided. The jury returned a verdict of "Accidental death," and expressed the opinion that there should be more rigorous inspection.

Faraday House Old Students' Association.

The annual dinner of the Old Students' Association of the Faraday House Electrical Engineering College will be held at the Savoy Hotel, London, on Friday, October 26th, at 7 p.m. Mr. F. E. Berry, A.M.I.E.E., D.F.H., director and manager of the British Electric Transformer Co., Ltd., and president of the Association, will be in the chair.

Electric Train Smash.

On September 19th an electric train entering No. 8 platform at Charing Cross station ran into the buffer stops and caused some of the front coaches to be partly telescoped.

An inquiry was opened by Col. Sir JOHN PRINGLE, for the Ministry of Transport, on September 24th, into the cause of the accident. Conflicting evidence was given by witnesses. Frederick Warman, ticket collector, said that the brake was not on when the train ran into the stops. Another collector said he saw sparks, showing that the brake was on. Richard Caselli, the driver, said the brake was good when the train left Crayford, but at Lee it was not so effective, and at subsequent stops the brake was not working well. It was on the whole of the time the train was travelling the length of the platform. In concluding the inquiry, Sir John Pringle said he would examine the coaches and the braking.

Local Societies.

Mr. G. F. Francis, of the Electrical Development Association, recently addressed the Exeter Rotary Club on "Electricity," with special reference to the Electricity (Supply) Act, 1926.

About 70 members of the Lincoln Engineering Society visited the new electrical sub-station in the works of Messrs. Robey and Co., Ltd., on September 19th. Hewittic mercury-arc rectifiers convert an a.c. supply at 6,600 volts to d.c. at 460-480 V.

Staff Changes under National Electricity Scheme.

In a circular to electricity authorities the District Joint Board of Employers and Members of Staff of the Electricity Supply Industry, Greater London area, points out the possibility that when the scheme contemplated by the Electricity (Supply) Act, 1926, comes into operation, many changes may have to take place in the technical staffs of the electricity undertakings. It desires so far as is possible to reduce any disorganisation or cases of hardship likely to arise in the industry as a result thereof. With this object an Area Committee has been set up to assist a Central Displacement Committee which will be able to give assistance to engineers likely to be displaced, and to undertakings requiring engineers. Its object will be to get into touch with undertakings and endeavour to secure appointments for engineers who might be displaced owing to the operation of the Act. In the event of any engineers remaining surplus to the requirements of the area, full particulars will be forwarded to the Central Displacement Committee, which will endeavour to place the engineers in other areas. Undertakings are asked to co-operate by giving the Committee an opportunity of filling vacancies before advertisements are issued, thus mitigating any possible cases of hardship and at the same time supplying undertakings with competent and efficient engineers.

Electricity Consumers Run a City.

The National Electric Light Association (United States) draws attention to the city of Colby, Kansas, where the entire municipal expenses are defrayed from the profits of the electricity undertaking. It is shown that this inevitably means that far higher prices are charged for electricity than in other towns where rates are a separate item. The bills of consumers in Colby and in an average American town are compared, and it is seen that for a consumption of 10 kWh the bill in Colby is almost double, while for higher consumptions it is three times that of the average city's bill.

Electricity in the Production of Iron.

The process of the Duffield Iron Corporation for producing iron direct from the ore has, as a result of experiments carried out in Germany, been found impracticable, and the German Steel Trust has terminated its negotiations for its acquisition, says the *Daily Mail*. The Steel Trust, in collaboration with the Krupp firm in Essen, has decided that the Norsk process gives the best practical results, and is best adapted for the production of iron in large quantities. It has therefore formed the Eisen Schwamm Company with a capital of £5,000 to develop the process. A start has already been made with the erection of the plant, and it is hoped that work may be commenced in about a year's time. Gas is used in this process and the iron is extracted at low temperatures by means of electric current. It is anticipated that the process will effect a great saving in raw materials.

The Volta Temple.

The Volta Temple, which, by the munificence of the Hon. Signor Somaini, has been erected at Como as a permanent memorial to the work of the scientist Volta, was recently inaugurated in the presence of representatives of all the universities and electrical associations in Italy.

Television.

Some time ago the Baird Television Development Co. applied to the Post Office for a licence to broadcast a television service, and as a result Post Office tests of the Baird system have been made, says the *Daily Telegraph*. No details are yet available as to the latest opinion of the Post Office engineers, and probably no opinion will be expressed until the tests have been concluded; but it is considered very probable that a limited number of "public" tests will also be made, in order that "observers" may have an opportunity of judging for themselves.

Embankment Subway Fire Inquiry.

Under the provisions of the City of London Fire Inquests Act, Dr. F. J. Waldo, the City Coroner, opened an inquiry into the cause of the recent fire in the subway at Victoria Embankment. During the hearing Superintendent Livitt, of the London Fire Brigade, said it was possible that a lighted match or a cigarette end thrown down the grating might have caused the fire. Mr. C. A. Baker, divisional engineer of the L.C.C., said that all the cables in the section of the subway concerned were seriously damaged, but no fusion of copper was discovered. He was of the opinion that the interval between the switching-on of the embankment lights and the calling out of the Fire Brigade (3 min.) was so short as to preclude the possibility of the electric circuits from the embankment lighting having caused the fire. The hearing was adjourned until September 27th.

Radio Valve-anode Capacitive Resistance.

We have received the following letter from Mr. J. H. Owen Harries, as we go to press:—"In reply to Mr. Braendle's letter in your last issue on this subject, in which I was very interested, he states in his first letter that his whole argument depends on the distinction he draws between the current flowing through a fixed resistance and battery in series with an a.c. generator, and that through a varying resistance and a fixed voltage battery. My analysis, with which Mr. Braendle agrees, according to his last letter, makes a special point of showing that there is no foundation for such a distinction and gives, as a specific instance, the fact that a valve output circuit can be considered in either of these ways without affecting the results as regards the current flowing. Further comment seems needless."

In Mid-Air.

The accompanying illustration shows workmen performing an acrobatic feat while placing in position overhead electric cables at Sedlescombe, Sussex, which is in a large rural area

"Overhead" at Sedlescombe.

to be supplied by the Hastings municipal power station. Sedlescombe has recently objected to the "beauty" of its village street being "marred" by standards similar to the one shown in the picture.

The Model Engineer Exhibition.

The tenth Model Engineer, Small Power Engineering and Scientific Exhibition, organised by Messrs. Percival Marshall and Co., was held at the Royal Horticultural Hall, London, last week. As usual, there were all manner of very interesting and instructive models on show, particularly in the competition section. From the electrical point of view the activities of model engineers seem to be mostly concerned with railway work. There were to be seen a number of excellent scale models of electric locomotives of the Metropolitan and other Railways. If the claims of some model engineers that their work has a real bearing on general industrial and commercial development may be taken as justifiable, then the exponents of railway electrification may take heart at the manner in which many builders of steam locomotive models have overcome their "propulsion" difficulties by equipping their models electrically. There were also some models of electrically driven ships to be seen. A feature of the exhibition was the displays of light tools. Messrs. Buck & Ryan showed a selection of light sensitive drilling machines, electric drills, drill grinding jigs, and so on, and Atalanta, Ltd., displayed its very interesting range of specialities, including screwdrivers and box spanners designed particularly for wireless assembly and adjustment, and a home electric repairing outfit. Messrs. Stuart Turner, Ltd., showed some models of their country-house lighting equipment. Model apparatus illustrating the working of the automatic telephone system was shown by the London Telephone Service. Perhaps the most popular item of the exhibition was the Robot which officially opened the exhibition; although it was run as a side show, this weird piece of mechanism, which makes certain movements and "talks," is electrically operated and voice controlled, and is apparently an advance on the special feature of the show last year, when an electrically-driven train was controlled by the voice.

Appointments Vacant.

Telephone linesman (£250) for the Government of the Falkland Islands. Charge engineer for the Hull Corporation Electricity Department. E.h.p. plumber-jointer for the Stoke Newington Borough Council Electricity Department. Showroom lady assistant (£157) for the Burnley Corporation Electricity Department. Chief clerk for the Guildford borough electrical engineer's office (£200). Installation engineer for the Tonbridge Corporation Electricity Department. (See our advertisement pages to-day.)

Boiler Explosion Report.

We have received a copy of the official report of the preliminary inquiry into the cause of the explosion of a water-tube boiler at the Eastcroft electricity generating station, Nottingham, in May last. One of the tubes failed longitudinally over a length of 9 in. The ruptured tube had become so thin that it was no longer able to resist the pressure at which it was being worked.

An Igranic Luncheon.

The directors of the Igranic Electric Co., Ltd., entertained a large company of representatives of the radio trade to luncheon in the Pillar Hall, Olympia, on September 24th. Mr. G. A. Mower, managing director, was in the chair. After the loyal toast and a toast to the radio trade, Mr. J. T. Mould, sales manager, briefly outlined the company's aims. Referring to the friendly relations between the company and the trade, he said that these could only be sustained by the company's ability to supply apparatus of the right quality and quantity at the right time, and at a saleable price. He admitted that the price had been somewhat of a handicap, but he considered that a price a little over the under-cut was necessary if the quality was not to suffer. Owing to the company's activities in other branches of electrical engineering, it had not hitherto given the attention to the radio side of the business that it would have liked, but in future it proposed to devote greater attention to it. With this object in view, a radio superintendent had been appointed to take charge of the radio manufacturing development, advertising experts had been engaged, and the company had issued, free of charge, a booklet called "Radio, How it Works, and How to Get the Best from it," with a view to assisting non-technical readers to understand the main principles involved in transmission and reception. A vote of thanks was proposed by Mr. Will Day, on behalf of the guests.

Report on Fuel and Power.

The report of the National Fuel and Power Committee, appointed by the Board of Trade in 1926, with Sir Alfred Mond (now Lord Melchett) as chairman, was issued this week (H.M. Stationery Office, Cmd. 3,201, price 9d. net). It refers mainly to the economic use of fuels and the production of power, and gives statistics concerning the consumption of coal, gas, and electricity, especially for industrial purposes. The research work in progress is surveyed, and the necessity of training men with suitable qualifications is emphasised. Other subjects dealt with are the preparation of coal for the market, the use of low-grade fuels, the carbonisation of coal, the generation of steam, and domestic fuel.

Amongst the conclusions and recommendations of the Committee are the following:—Information regarding fuel consumption in industry is required, and it may be desirable before another Census of Production is undertaken to recommend the Government to obtain compulsory powers for requiring users to give details of the amount of fuel used and the purposes to which it is put.

Industrial leaders in the fuel-producing and fuel-consuming industries should consider the need for co-operation with the Universities by indicating the responsible positions that are open on the executive side of their businesses for men trained in fuel technology.

All large coal-consuming industries should consider the desirability of adopting on a much larger scale than at present the practice of an exchange of experiences in fuel technology, if possible through central associations financed by small levies.

Large consumers would be well advised to pay more attention to the system of buying and selling coal to a specification, and colliery owners would benefit the smaller consumers and, in the end, themselves, by classifying their coal so far as possible according to some agreed standards.

Each District Coal Owners' Association should, in conjunction with the Electricity Commissioners, consider in what way the collieries of its district can take part in electricity development.

The possibility of the use of low-grade fuel should be carefully considered when the site for any new electricity generating station is under consideration and when the plant for the station is designed, and the desirability of making any necessary adaptations of plant for the use of such fuel should be considered even for the existing stations.

The Government should undertake an investigation of the technical and economic aspects of an area gas supply system comprising an interconnecting network of pipe lines fed by a number of gas works, coke ovens, and the like.

North-East Coast Institution of Engineers and Shipbuilders.

The N.E. Coast Institution, which opens the new session on October 19th, has issued, for the first time, a handbook of general information about its activities and organisation, illustrated with views of the interior of its headquarters, Bolbec Hall.

The Danish Radio Exposition.

On September 15th the Copenhagen radio exposition, arranged by the radio wholesalers' federation in Denmark, was opened, and its removal this year to the great "Tivoli" music hall is of hopeful significance for the future of radio development in Denmark. Notwithstanding the facts that the radio service is very popular in all circles and that broadcasting is on a high level, a great many Danish farms are not equipped with radio receivers, and the aim of Danish manufacturers will now be to conquer this field. The greater part of the valve radio sets that were to be seen at the exposition were constructed to work without batteries, and it will be understood that the growth of rural electric service in Denmark will justify this development. It is a remarkable fact that the major proportion of radio sets served by the near-by stations in Denmark are equipped with valves where a crystal detector would suffice. By far the greater part of the radio sets exhibited were made in Denmark, but the components used in them were of foreign origin, imported from England and Germany. Much interest was created by a successful demonstration of the "Theremin" musical instrument, and audible "movies" (a Danish system) were also to be seen and heard at the exposition.

Association of Supervising Electrical Engineers.

Mr. S. B. Donkin, M.Inst.C.E., M.I.E.E., M.I.Mech.E., the consulting engineer, has accepted the position of president of this Association, and will deliver his address at the opening meeting of the session 1928-9, at the Junior Institution of Engineers, 39, Victoria Street, London, S.W.1, on October 2nd, at 7.15 p.m. Mr. A. M. Sillar will introduce the new president, who will deal primarily with the development of electricity supply, giving a general survey of the position arising from the 1919 and 1926 Acts. The methods adopted by the Electricity Commissioners, and the various schemes will also be explained. Certificates will be presented to the winners of prizes in the "Economic Premiums" Competition for 1927, and certificates and prizes will be presented to the winners in the W. E. Highfield Shield Competition of 1928. Refreshments will be served between 6.30 and 7 p.m.

Educational.

The Report of the Departmental Committee on Examinations for Part-time Students appointed by the Board of Education in April, 1927, with the Duchess of Atholl as chairman, was issued last week (H.M. Stationery Office, price 1s. net). It relates mainly to students at evening classes and at part-time day continuation schools, numbering three-quarters of a million in England and Wales. It bears witness to the value of examinations as an incentive and an objective to the student, and as carrying weight with employers. The system of co-operation between the Board of Education and professional bodies of high standing (*e.g.*, the Institution of Electrical Engineers) is regarded with favour as guaranteeing the awards whilst allowing freedom to the teachers. The principles to be observed in planning and conducting examinations are outlined, and it is held that each student should undergo one test every year, and one only. Federations of authorities are recommended, and changes in organisation are proposed.

Our Personal Column.

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.

Mr. ROBERT LUND HORSFIELD, who, as already announced here, is recommended for the post of Tramways and Transport General Manager and Engineer at Leeds, has been for more than eight years general manager of the Cardiff Corporation Tramways and Motors. He is a Bradford man and is 54 years of age. Prior to his Cardiff appointment, he was for 17 years general manager of the Walsall Corporation Tramways. He went to Walsall from Bradford, where he had been chief assistant in the Corporation Tramway Department, and manager of the Bradford and Shelf Steam Tramways Co., following Mr. A. R. Fearnley, who is now general manager of the Sheffield Tramways. Mr. Horsfield is a well-known expert in the tramway and transport world. He has devoted the whole of his business career to tramway work, serving both municipal and company undertakings; he has been responsible for the introduction and operation of motor-'bus services in industrial districts (he received the M.B.E. for special work during the war in the transport of munition workers to and from the factories); in Parliamentary procedure connected with the passing of Bills and securing additional powers, he is well versed from experience from 1914 down to recent times at Cardiff; and his expert advice has been sought by many undertakings. He was president of the Municipal Tramways and Transport Association in 1926-1927, and is a member of the Institute of Transport.

H. J. Whitlock & Sons [*Cardiff.*

Mr. R. L. Horsfield.

On the occasion of his marriage to Miss MADGE ROSS, Mr. CHARLES NORMAN GOULD, chief secretary to the city electrical engineer at Salford, has been presented by the chief engineer and staff of the electricity works with an oak bureau.

The marriage took place at Prestwich, on September 12th, of Mr. WILLIAM RONALD HALL, eldest son of Mr. Percy B. Hall, director of Messrs. Erskine, Heap Co., Ltd., of Manchester, and Miss AMY MARION HUNT, of Prestwich.

Mr. F. HARDING, manager of the Derby Corporation tramways, is shortly retiring on superannuation. He was the manager when the Town Council took over the undertaking many years ago.

Mr. G. W. WIFFEN and Miss N. M. CLARK, of the staff of Crompton Parkinson, Ltd., Chelmsford, have been presented, on their marriage, with a canteen of cutlery and a breakfast cruet by the main drawing office staff, and with a fruit set and eiderdown by the office staff.

Obituary.—MR. E. SHEPPARD.—The death is announced, at the age of 53 years, of Mr. Edward Sheppard, who was formerly senior partner of the firm of Sheppard, Jarvis and Evered, electrical and mechanical engineers, of Victoria Gate, Taunton.

Will.—MR. C. T. CAYLEY, a director of the English Electric Co., Ltd., and other companies, left £140,826 gross and £105,306 net personalty.

Financial Section.

New Companies, Returns of Share Capital, Debenture Changes, Reports of Electrical Companie Dividend Results, Transactions in Stocks and Shares.

New Companies Registered.

Perfection Radio Stores, Ltd.—Private company. Registered September 15th. Capital, £300 in £1 shares. Objects: To carry on the business of manufacturers of wireless apparatus, cutlery, ironmongery, agricultural machinery, implements and tools, brass founders, metal workers, electrical engineers, makers of motor-propelled engines, &c. The subscribers (each with one share) are: M. Skulnick, 147, Brownlow Hill, Liverpool, wireless dealer; H. Marsden, 2a, Lichfield Road, Blackpool, salesman. M. Skulnick is permanent managing director. Registered office: 1, Crosshall Street, Liverpool.

Graham Farish, Ltd.—Private company. Registered September 20th. Capital, £5,000 in £1 shares. Objects: To carry on business as manufacturers of and dealers in wireless equipment, electrical, mechanical, and general engineers, and contractors; to manufacture and sell transformers, radiators, dynamos, motors and wireless instruments, to manufacture insulating materials, &c. The directors are: T. G. Farish, 46, Culverley Road, Catford, S.E. (managing director); L. W. Farish, 46, Culverley Road, Catford, S.E., traveller; W. H. Mills, 59, Hawkstone Road, Rotherhithe, S.E., manager. Secretary: L. W. Farish. Registered office: 17, Masons Hill, Bromley, Kent.

Prescott & Hodgkinson, Ltd.—Private company. Registered September 19th. Capital, £1,000 in £1 shares. Objects: To carry on the business of industrial and electrical engineers and contractors, suppliers of electricity, carriers of passengers and goods, manufacturers of and dealers in rail, tram, road, air and water way, electrical, magnetic, galvanic and other apparatus, &c. The first directors are: W. H. Prescott, "Highlands," Woldingham, Surrey (chairman); W. Hodgkinson, Greenhills, Amersham, Bucks., engineer; W. O. Prescott, Etineham, Red Down Road, Coulsdon, engineer. W. Hodgkinson signs as joint managing director. Solicitors: Summerhays, Son & Barber, 19, Eastcheap, E.C.3.

Official Returns of Electrical Companies.

Ellesmere Port Electrical Co., Ltd.—Capital, £500 in £1 shares. Return dated June 20th, 1928. 400 shares taken up. £251 paid. £149 considered as paid. Mortgages and charges nil.

Asbestos and Electrical Fittings Co., Ltd.—Capital, £39,994 in £1 shares. Return dated June 26th, 1928. 10,006 shares taken up. £615 paid. £9,391 considered as paid. Mortgages and charges nil.

Tetbury Electric Supply Co., Ltd.—Capital, £6,000 in 600 cumulative preference shares of £5 each and 3,000 ordinary shares of £1 each. Return dated June 28th, 1928. 300 preference and 2,107 ordinary shares taken up. £3,607 paid. Mortgages and charges nil.

A.F.A. Accumulators, Ltd.—Capital, £5,000 in £1 shares. Return dated August 2nd, 1928. All shares taken up. £1,251 paid. £3,749 considered as paid. Mortgages and charges nil.

Henley's (South Africa) Telegraph Works Co., Ltd.—Capital, £2,000 in £1 shares. Return dated August 24th, 1928. All shares taken up. £2,000 paid. Mortgages and charges nil.

Ellis & Ward, Ltd.—Capital, £10,000 in 2,000 preference and 8,000 ordinary shares of £1 each. Return dated August 13th, 1928. 1,000 preference and 6,003 ordinary shares taken up. £1,003 paid on 3 ordinary and 1,000 preference shares. £6,000 considered as paid on 6,000 ordinary shares. Mortgages and charges nil.

Indo-European Telegraph Co., Ltd.—Capital, £450,000 in £25 shares. Return dated May 14th, 1928. 17,000 shares taken up. £425,000 paid. Mortgages and charges nil.

Witton-James, Ltd.—Capital, £6,100 in 2,000 preference and 4,000 ordinary shares of £1 each and 2,000 deferred shares of 1s. each. Return dated June 30th, 1928. All shares taken up. £2,000 paid on 2,000 preference shares. £4,100 considered as paid on 4,000 ordinary and 2,000 deferred shares Mortgages and charges £25,000.

S. H. Heywood & Co., Ltd.—Capital, £50,000 in £1 shares. Return dated June 7th, 1928. 31,999 shares taken up. £4,000 paid. £27,999 considered as paid. Mortgages and charges nil.

O. C. Hawkes, Ltd.—Capital, £200,000 in £1 shares (100,000 preference and 100,000 ordinary). Return dated March 15th, 1928. 85,200 preference and 85,000 ordinary shares taken up. £105,095 paid. £65,105 considered as paid. Mortgages and charges nil.

Hexham and District Electric Supply Co., Ltd.—Particulars filed of £10,000 debentures authorised August 27th, 1928, charged on the company's undertaking and property, present and future, including uncalled capital (subject to a certain first debenture authorised February 24th, 1922), the amount of the present issue being £6,500. Satisfaction in full on August 31st, 1928, of two floating charges dated August 24th, 1923, and October 23rd, 1924, securing £2,000 and £1,000, respectively.

Burgoyne Manufacturing Co., Ltd.—Debenture dated August 28th, 1928, to secure £4,000 charged on the company's undertaking and property, present and future, including uncalled capital. Holders: W. B. Fordham & Sons, Ltd., 36-40, York Road, King's Cross, N.1.

Beko Lamp Co., Ltd.—A. R. Green, 100–106, Moorgate Station Chambers, E.C.2, ceased to act as receiver or manager as regards the first mortgage debenture on May 15th, 1928. (Notice filed September 15th.)

Nico Light Co., Ltd.—Debenture charged on 19 and 21, Farringdon Avenue, E.C., and the company's undertaking and property, present and future, including uncalled capital, dated August 29th, 1928, to secure all moneys due or to become due from the company to Lloyd's Bank, Ltd.

City Notes.

Crompton Parkinson, Ltd.

This company's first annual meeting was held on September 20th. Mr. F. Parkinson (chairman) presided, and in presenting the report and accounts (*vide* ELEC. REV., September 14th, p. 451) pointed out that under the articles of association only holders of the deferred shares were entitled to attend and vote at a general meeting except when certain special circumstances arose. The directors had, however, invited the other shareholders to attend to hear an account of the results so far obtained and changes made or contemplated. He was glad to announce that Col. R. E. Crompton had agreed to rejoin the board. Apart from sentimental grounds, his unique experience and knowledge would be of great value to the company. The profit earned during the 15 months under review compared very favourably with the previous combined earning capacities of the two companies, showing about 26 per cent. increase. They had created a capital reserve account representing the difference between the purchase consideration for the shares in F. & A. Parkinson, Ltd., and the par value of the shares allotted for the satisfaction of this consideration. They had commenced to reap the advantages of the unification of control; they had been able to pool their experience and take the best from each side for the benefit of the whole. They had combined their selling forces and so avoided duplication of effort and the policy had been directed towards the various departments where it could be employed with benefit.

It would not appear to be unduly optimistic to expect even better results next year but there were outside circumstances to be considered and he did not feel justified in making a prophecy. It was proposed to sub-divide the deferred ordinary shares into 200,000 shares of 5s. each and to create a similar number and issue them to the holders as bonus shares paid up out of reserves. At the same time the voting power of the deferred ordinary shareholders would be reduced to one vote per share—or 400,000 votes in all, as at present. The deferred ordinary capital was at present held privately, but arrangements would be made to make some of it available to the public at an early date. The report and accounts were adopted.

A Belgian Loan in London.

On Tuesday last Messrs. M. Samuel & Co., Ltd., offered for sale, on behalf of the Société Intercommunale Belge d'Electricité, £500,000 of 35-year sinking fund 5½ per cent. sterling bonds at the price of 91 per cent. The Société Intercommunale was formed in 1901, and is the largest public electricity supply authority in Belgium. Its output represents 30 per cent. of the total production of all Belgian public service companies, and in 1927 amounted to over 320 million kWh. The company's entire technical and business administration, and that of affiliated concerns, is conducted by the Société Générale Belge d'Entreprises Electriques. The proceeds of the sale will be used in connection with the completion of the acquisition of additions to the company's properties and the purchase of capital stock of the Société Générale Belge de Production d'Electricité (Interescaut) which the company has formed in conjunction with the Société d'Electricité de l'Escaut. The average earnings for the past 3¼ years are sufficient to cover the whole of the company's funded indebtedness, including the present issue, over five and a-half times.

Stock Exchange Notices.

Application has been made to the Committee to allow the following to be officially quoted:—

Urban Electric Supply.—160,000 ordinary shares of £1 each, fully paid, Nos. 240,001 to 300,000 and 700,001 to 800,000.

Dealings in the following securities have been specially allowed by the Stock Exchange Committee under Rule 159. Asterisk dealings will not be permitted until after the issue of letters of allotment or acceptance.

*Burndept Wireless (1928).—600,021 shares of 5s. each, 3s. 9d. paid, Nos. 1 to 600,021.

Underground Railways.—30,000 ordinary shares of £1 each, fully paid, Nos. 5,671,378 to 5,701,377.

*Wireless Pictures (1928).—1,425,000 ordinary shares of 1s. each partly paid and fully paid, Nos. 1 to 1,425,000.

Ward & Goldstone, Ltd.

The statement published on p. 491 of our last issue regarding this company's dividends was incorrect. For the year ended March, 1928, a final dividend of 4 per cent. on the ordinary shares was declared, also a participating dividend of 1 per cent. on the preference shares, in addition to the interim dividends already paid at 7 per cent. per annum, thus actually making 11 per cent. and 8 per cent. for the year, respectively. These additional dividends, over and above the 7 per cent., are being paid along with the interim dividend (which is also 7 per cent. per annum for the current year), which will be payable on September 30th. Therefore, the dividends being paid are identical with those paid at the same period last year.

Lighting Trades, Ltd.

The profit for the year ended March 31st last amounted to £12,304 (against £11,637). After adding income from investments, &c., and the balance brought forward, and providing for depreciation, there remains a balance of £20,262. It is proposed to pay the preference dividend and to carry forward £3,125. The report says that the acquisition of the business of J. & W. B. Smith, Ltd., has improved the general turnover of the company. Meeting: To-day (Friday).

Bruce Peebles & Co., Ltd.

A dividend of 3¾ per cent. has been declared on the 7½ per cent. cumulative participating preference shares for the half-year ended June 30th.

Burndept Wireless (1928), Ltd.

It was announced last week that the recent issue made by this company was over-subscribed.

British Aluminium Co., Ltd.

An interim dividend of 4 per cent. has been declared on the ordinary shares, as in 1927.

British Columbia Power Co.

An initial dividend of 50 cents per share has been declared on the "A" shares for the quarter ending September 30th.

Folkestone Electricity Supply Co., Ltd.

An interim dividend at the rate of 8 per cent. per annum (as last year) has been declared on the ordinary shares.

General Electric Co., Ltd.

At an extraordinary general meeting on Monday last the resolutions providing for the retention of the control of the company in British hands were unanimously confirmed.

Stocks and Shares.

MONDAY EVENING.

OUTSTANDING features of excitement in the Stock Exchange markets have been sharp rises in the prices of Marconi shares, followed by a burst of strength in the quotations of the Eastern Cable group. The jump in Marconis is attributed to various causes, the most popular being that, at their break-up value, Marconi shares are worth anything between 87s. and 92s. We repeat the figures simply for what they may be worth, and as one of those airy Stock Exchange estimates for which there may or may not be foundation. At any rate, the way in which the price has been run up is obvious evidence of pretty substantial buying, because Marconis do not rise 5s. in a fortnight unless there is a heavy volume of support at the back of the movement. The £1 shares have come up to some extent, and are now 4¾, speculation being more inquisitive than ever as to what may be the relative position of these shares as compared with that of the 10s. shares. We have had so much to say on the point in the past, emphasising the uncertainty which prevails, that there is nothing left to add at the moment, especially as the probability is that even the company itself might find difficulty in determining the precise relationship between the two classes of shares—a matter which, it seems to us, will have to be fought out in the Law Courts, unless it is determined by arbitration. Marconi Marines are 4s. better. Canadian Marconi went back to 29s. 9d., but recovered to their previous price of 31s. 3d. The interest in these is so much confined to American and Canadian sources that buying or selling from the other side forms the main factor in raising or depressing the price.

Newcomers.

Dealings have now started in the new Burndept shares, of 5s. each with 3s. 9d. paid. The price opened at a premium of about 3d. per share. Another newcomer is the Wireless Pictures (1928), details of which were given here last week, on page 490. Applications for the shares were extremely heavy, and the stags turned out in force. The price began at 1s. premium. Baird International Television "A" shares are a very lively market, between ten shillings and half-a-guinea. The public are gambling in a manner which arouses concern amongst people who have seen this thing before, and who know what it leads to later on.

Cable Stocks Boom.

The cable stocks have followed the rise in Marconis, and have risen quite as breathlessly. Eastern ordinary has gone up 12½ points to 260, and the three shares—Westerns, Eastern Extensions, and Globe ordinary—are all better to the extent of 15s. or so. Opinion gains ground that there will be, before long, a cut-and-dried scheme presented for exchanging the existing securities of the cable companies and of the Marconi Wireless undertaking, for others in the new concern, divided into two parts, of which full particulars have already been published. On the basis of dividend payments, the existing prices for the Eastern stocks and shares, as well as that for Marconis, are far too inflated, but these are days in which speculation looks several years ahead, and the fact that stocks and shares pay less than 4 per cent. (free of tax) on the money, such as those of the cable quartette, is of no particular account to people who are looking for such rearrangement of the capitals as will involve a division of the stocks and shares into new securities, and, possibly of higher dividends.

Shares on Offer.

There is on offer at the time of writing a few thousand pounds Anglo-American Telegraph deferred ordinary stock at 24. The dividend is paid once a year, in February, and is guaranteed at 1½ per cent. The security is good enough to make the stock worth the attention of the speculative investor, who considers 6½ per cent. on his money a reasonable return with good security. Of electrical shares that are available, mention may be made of 500 Brush ordinary at 29s. 6d. Bournemouth and Poole ordinary are on offer at 3½, a thousand County of London Electric ordinary can be obtained at 40s. 6d., and 2,000 Londons at 28s. 3d. Metropolitan Electric Supply are to be bought at 47s. 3d. A fair line of Westminsters, some 5,000 shares, has been offered at

28s. At this price, Westminsters pay 6¼ per cent. on the basis of the dividend of 8.8 per cent., which is likely to be maintained until 1931, when the rate drops to 7 per cent. in company with that of other London undertakings.

Electricity Supply.

Electricity supply shares are quietly firm, the London list showing little change, and the provincial issues being somewhat irregular on balance. In the former group, Metropolitans are easier at 47s., and, in the latter, Midland Electric Power Distribution shares lost 9d. at 40s. 6d. Midland Counties drooped to 30s. 6d. Clyde Valley shares at 40s. hold their gain: Yorkshire Electrics have risen to 38s. The principal gain is one of 3s. 9d. in Newcastle-on-Tyne ordinary shares, which have advanced to 30s. This rise is due to the interest which has been aroused by the announcement made in connection with the Fuel Conference regarding progress towards the combination of low temperature carbonisation and electric power production. Some people have been talking of the possibility of the company being able to produce electrical power at less than a farthing per unit! The statement aroused a good deal of interest, and brought in fresh business. Further announcements that should be made this week are awaited with lively interest in the Stock Exchange market. North Metropolitan ordinary are up to 50s. 3d.

Manufacturing Shares.

English Electrics have gone back to 7s., but this is the only decline in the list of manufacturing companies. Henleys are better, and Brush ordinary rose to 28s. 9d. British Aluminium held their price of 47s. 6d. Anticipation looks for a possible bonus in the shape of shares, but nothing of this kind has yet been made public. The directors announce an interim dividend of 4 per cent. actual, payable next Monday. The rate is the same as that of a year ago. The big rises in cable stocks had no particular effect upon the prices of the shares in companies associated with them in business. The British Columbia Power Corporation has declared a dividend of 50 cents per share on class "A" shares, payable on October 15th. Crompton Parkinson held their rises, the preferred ordinary being 18s. At the annual general meeting held last week, the chairman stated that it was proposed to sub-divide the present deferred ordinary shares, to augment these by the creation of a further number, and to make some portion of this capital available for the public at an early date. The General Electric and the Callender's Cable companies will doubtless benefit considerably by the big contracts just placed with them by the Central Electricity Board.

Railways and Traction.

Interest in Home Railway stocks is still lackadaisical. Underground Electric Railways income bonds and £1 shares are a trifle lower on the ballot of London omnibus drivers and conductors in regard to present wages and service conditions. The result of the ballot is to be made public on Thursday in this week. Districts fell ½ to 79 in sympathy. British Electric Traction 6 per cent. participating preference is 3 points up at 129. The two last half-yearly dividends on this stock were 60s. and 90s. Lancashire United Transport and Power shares are changing hands on the basis of 11s. 3d. Bermuda Traction 7 per cent. participating debenture keeps closely to 4 discount on the issue price of 100, and the shares are steady at 12s. London United Tramways ordinary are quoted at a shilling, the preference at 7s. 3d. London and Suburban Traction preference find a difficulty in getting away from 10s. 6d., and the ordinary can be bought at about 3s.

Overseas Utilities.

While Mexico Tramways shares have strengthened to 42½, the shares of the Mexican Light & Power Company shed 4 points, to 80½, and the first bonds lost 1, falling to 78½. International Holdings and Hydro-Electrics are dull, the Continent affording no support. Shawinigan Common shares rose to 93¼, Montreal Light & Power to 111½, the Canadian-Americans being good, on the whole. Brazilian Tractions improved to 61½; the 6 per cent. preference at 200 are ex the quarterly dividend of 1½ per cent. Winnipeg Electric 5 per cent. refunding mortgage stock is being negotiated around 91½. An issue of Belgian Electric 5½ per cent. bonds was made on Tuesday in this week at 91. The fact of the application money being 25 per cent., to be followed by payment of the remaining 66 per cent. on October 3rd, was regarded as a hint that stag operations were not encouraged.

The Speculative Spirit.

Babcocks are a firm spot at 70s., and the speculator is buying low-priced iron and steel shares on the assumption that a trade revival is not far off. The rubber share market finds more apologists on paper than buyers of its shares. Prices remain depressed in most of its sections. The public are speculating heavily in shares connected with coal processes, gramophone records, and other industries which have caught popular imagination. It deserves to be noticed, however, that shares in older and more stable concerns are not greatly affected by the necessity of providing capital with which to finance the purchase of the active speculative issues. From this it is inferred that the amount of floating capital must be considerable.

Share List of Electrical Companies.

Home Electricity Companies.

	Nom.	Dividend. 1926.	1927.	Price Sept. 24, 1928.	Rise or fall.	Yield. p.c.
	£					
Bournemouth and Poole	1	14†	15	8½	—	... ...
Brompton Ordinary	1	8⅜	8½	27/-	—	5 3 8
Charing Cross Ordinary	1	8½	8½	27/-	—	5 3 8
do. do. 4½% Pref. ...	1	4½	4½	17/6	—	5 2 10
Chelsea	1	8⅛	8⅛	27/6	—	5 1 10
City of London	1	10	10	33/3	—	4 4 4
do. do. 6% Pref. ...	1	6	6	23/-	—	5 4 4
Clyde Valley	1	8	8	2	—	4 0 0
County of London	1	7½	7½	40/6	—	3 14 8
do. do. 6% Pref. ...	1	6	6	23/6	—	5 2 2
Edmundsons' 7% Pref.	1	7	7	25/6	—	5 9 10
Elec. Supply Corporation	1	11	11	52/-	—	4 4 9
Kensington Ordinary	1	8	8	26/6	—	5 5 8
Lancs. Light and Power	1	7½	7½	30/6	—	5 0 0
London Electric	1	8½	8½	28/-	—	4 18 8
Metropolitan	1	8	9	47/-	—1/9	3 16 9
do 4½% Pref.	1	4½	4½	17/6	—	5 2 10
Midland Counties	1	6	6½	31/-	—6d.	4 3 10
Mid. Elec. Power	1	—	15	40/6	—9d.	... ...
Newcastle-on-Tyne Ordinary ...	1	5	6	30/-	+3/8	4 11 5
do. 7% Pref. ...	1	7	7	26/6	—6d.	5 3 8
Notting Hill 6% Pref.	10	6	6	10⅜	—	5 11 7
North Met. Elec. 6% Pref. ...	1	6	6	23/-	—	5 4 4
St. James' and Pall Mall	5	8	8	27/6	—	5 1 10
Scottish Power	1	8	8	32/6	—	4 18 6
South London	1	8½	8½	27/-	—	5 3 8
Urban Ordinary	1	7	7	35/-	—	... ...
Westminster Ordinary	1	8½	8½	27/-	—	5 3 8
Whitehall Elec. Invst. 7½% Pref....	1	7½	7½	24/3	+3d.	6 5 0
Yorkshire Elec.	1	8	8	38/-	+6d.	4 5 4

Home Rails.

Central London Ord. Assented ...	Stock	4	4	72	—	5 11 1
Metropolitan	,,	3	3	67½	—	4 9 0
do. District	,,	3½	4	79	—½	5 1 3
Underground Electric	£1	1½	5	27/-	—6d.	3 14 1
do. do. Income ...	Bonds	6	6	129	—1	4 13 0

Telegraphs and Telephones.

Anglo-Am. Tel. Pref.	Stock	6	6	104	—	5 15 5
do. Def.	,,	1½	1½	24½	+⅛	6 4 0
Automatic Telephone	1	10	10	43/9	—	4 9 0
Eastern Extension	10	10	10	25⅞	+⅜	*3 18 2
Eastern Tel. Ord.	Stock	10	10	260	+12½	*3 18 6
Globe Tel. and T. Ord.	10	10	10	25⅜	+⅜	*3 18 9
do. do. Pref.	10	6	6	11⅛	—	5 7 10
Great Northern Tel.	10	20	20	38½	—	5 4 0
Indo-European	25	10	10	46½	—	*5 7 6
Marconi	10/-	5	*10	3⅞	+1/16	... ...
Marconi-Marine	1	8½	12½	56/6	+4/-	4 8 6
Oriental Telephone Ord.	1	12	12	57/6	+1/8	*4 3 6
United R. Plate Tel.	5	8	8	9½	—⅛	*4 2 0
Western Telegraph	10	10	10	25⅞	+⅜	3 18 2

*Interim.

Home and Foreign Trams, &c.

Anglo-Arg. Trams First Pref. ...	5	5½	5½	3⅝	—	7 11 9
do. do. 2nd. Pref. ...	5	6	6	3½	—	8 11 6
do. do. 5% Deb. ...	Stock	5	5	78½	—	6 7 5
British Electric Traction Def. Ord.	,,	—	—	520	—	... ...
do. do. Pref. Ord.	,,	8	7½	125	—	6 0 0
Brazil Traction	100	6	7	61½	+1	2 17 8
Brit. Colombia Elec. Rly. Pcc. ...	Stock	5	5	96½	—	5 3 9
London & Sub. Trac. 5% Pref. ...	1	Nil	Nil	10/6	—	... ...
London United Tram Deb. ...	Stock	4	4	60½	—	6 12 3
Mexico Trams, 5% Bonds	—	5	5	78	—	6 8 2
Mexican Light Common	100	Nil	Nil	80½	—4	... ...
do. 7% Pref.	100	Nil	7	77½	—	9 0 8
do. 1st Bonds	—	5	5	78½	—1	6 7 5
Yorkshire (West Riding)	1	Nil	Nil	5/-	—	... ...

Manufacturing Companies.

Babcock & Wilcox	1	13	15	70/-	—	*4 5 9
British Aluminium Ord.	1	10	10	47/6	—	*4 4 2
British Elec. Transformer Pref....	1	7	7	18/-	—	7 15 0
British Insulated Ord.	1	15	15	4⅞	—	3 11 9
Brush Ord.	1	10	10	28/9	+1/8	6 19 2
Callenders	1	15	15	4⅛	—	3 14 0
do 6½% Pref.	1	6½	6½	23/9	—	5 9 5
Crompton Parkinson Pref Ord. ...	1	—	6	18/-	—	6 13 4
do. 8% Pref.	1	—	8	26/3	—	6 2 0
Edison-Swan	4/-	10	10	12/6	—	3 4 0
do. 5% Deb.	Stock	5	5	89½	—	5 11 9
Electric Construction	1	7½	7½	27/6	—	5 9 1
Enfield Cable Ord.	1	20	20	4⅜	—	4 11 6
English Electric	1	Nil	Nil	7/-	—6d.	... ...
do. do. Pref	1	8	Nil	10/-	—	... ...
Gen. Elec. Pref.	1	6½	6½	24/6	—	5 6 1
do. Ord.	1	7½	10	41/-	—	4 17 7
Henley	1	25	25	5⅞	+1/16	4 9 9
do. 4½% Pref.	5	4½	4½	4½	—	5 6 0
India-Rubber	1	Nil	Nil	13/9	—	... ...
Johnson & Phillips	1	12½	10	1⅛	—	5 6 8
Met.-Vickers Ord.	1	8	6	33/3	—	3 12 3
do. Pref.	2	8	8	2⅜	—	6 1 11
Siemens Ord.	1	7½	7½	1½	—	5 0 0
Telegraph Construction	12	10	10	24½	—	*4 18 6

*Dividends paid free of Income Tax.

†4% of which was tax free.

Czecho-Slovakian Imports and Exports.

Figures for 1926 and 1927 Compared.

BELOW are shown the values during 1927 of Czecho-Slovakia's imports and exports of electrical material. The corresponding figures for 1926 are also given, together with a note of increases or decreases. The values are given in "paper" crowns, 163 of which equal £1.

Imports.

	1926. (1,000 Cwns.)	1927. (1,000 Cwns.)	Inc. or dec. (1,000 Cwns.)
* *Dynamos and electric motors (except those for motor cars), also permanently combined with mechanical contrivances or apparatus; transformers and convertors* :—			
Total	29,922	24,182	− 5,740
From Germany	13,311	12,846	− 465
„ Austria	11,618	7,437	− 4,181
„ Switzerland	3,833	2,053	− 1,780
„ Great Britain ...	212	202	− 10
Articles imported under special treaties :—			
(1) Electric fans and electric motors for fans.			
Total	929	1,211	+ 282
From Germany	508	839	+ 331
„ Italy	359	236	− 123
(2) Other articles.			
Total	13,512	28,127	+14,615
From Germany	5,080	8,685	+ 3,605
„ Sweden	6,080	15,541	+ 9,461
„ Austria	1,054	2,045	+ 991
Starting and lighting equipment for motor cars :—			
Total	12,380	11,677	− 703
From Germany	10,195	8,708	− 1,487
„ Switzerland	1,609	2,215	+ 606
„ France	492	41	− 451
Electrical telegraph apparatus, ringing, signalling and railway safety apparatus :—			
Total	2,167	1,046	− 1,121
From Austria	1,189	335	− 854
„ Germany	848	661	− 187
Telephone apparatus :—			
Total	24,961	32,714	+ 7,753
From Austria	13,724	24,523	+10,799
„ Germany	8,241	7,198	− 1,043
„ Belgium	2,386	440	− 1,946
Radio-telephone apparatus :—			
Total	39,871	31,561	− 8,310
From Germany	18,285	12,149	− 6,136
„ Austria	4,231	3,029	− 1,202
„ Hungary	201	224	+ 23
„ Great Britain	3,720	959	− 2,761
„ France	3,352	1,713	− 1,639
„ Holland	7,156	5,988	− 1,168
Electric measuring and calculating apparatus :—			
Total	14,346	15,863	+ 1,517
From Germany	7,275	7,789	+ 514
„ Austria	1,311	1,390	+ 79
„ Switzerland	5,450	5,999	+ 549
„ Great Britain	124	89	− 35
Switch and contact devices, mounted safety fuses and similar apparatus :—			
Total	2,053	1,596	− 457
From Germany	1,706	1,238	− 468
„ Austria	257	229	− 28
* *Glow and other similar lamps (excluding arc lamps)* :—			
Total	3,378	1,811	− 1,567
From Hungary	1,747	36	− 1,711
„ Germany	1,300	1,346	+ 146
„ France	160	35	− 25
† *Glow and other similar lamps* :—			
Total	15,362	22,056	+ 6,694
From Holland	7,021	8,312	+ 1,291
„ Austria	1,984	3,653	+ 1,669
„ Germany	4,893	5,985	+ 1,092
„ Hungary	1,399	3,586	+ 2,187
† *Reflectors and electric lamps for motor cars* :—			
Total	1,336	2,115	+ 779
From Germany	864	1,454	+ 590
„ France	150	207	+ 57
„ United States	123	163	+ 40
Röntgen lamps :—			
Total	983	989	+ 6
From Germany	520	604	+ 84
„ Austria	402	306	− 96
† *Carbon brushes, mounted; electric cooking and heating apparatus* :—			
Total	2,543	4,476	+ 1,933
From Germany	1,594	2,729	+ 1,135
„ Austria	361	517	+ 156
„ France	183	142	− 41
„ Italy	256	63	− 193
„ Great Britain	45	681	+ 636
† *Electrical apparatus for motor vehicles* :—			
Total	11,737	11,616	− 121
From Germany	8,487	8,365	− 121
„ Switzerland	1,680	1,561	− 119
„ France	674	214	− 460
„ Great Britain	296	515	+ 219
† *Motor car accumulators* :—			
Total	868	1,472	+ 604
From France	509	1,220	+ 711
„ Germany	207	141	− 66
„ Sweden	60	—	− 60
† *Other electrical apparatus and appliances, not specially mentioned (except lightning arrestors, arc lamps and mounted lamp holders)* :—			
Total	24,348	51,670	+27,322
From Germany	13,142	14,481	+ 1,339
„ Austria	5,417	3,299	− 2,118
„ Switzerland	950	930	− 20
„ U.S.A.	954	2,201	+ 1,246
„ France	3,262	7,157	+ 3,895
„ Belgium	77	14,177	+14,100
„ Great Britain	224	8,237	+ 8,013
Cables and wires :—			
(1) With metal casing.			
Total	160	626	+ 466
From Italy	23	—	− 23
„ Belgium	44	29	− 15
„ Austria	35	19	− 16
„ Germany	39	517	+ 478
(2) Without metal casing.			
Total	819	866	+ 47
From Austria	349	362	+ 13
„ Germany	283	315	+ 32
„ Italy	39	23	− 16
Accumulators and plates :—			
* Total	192	563	+ 371
From Germany	102	63	− 39
„ Austria	39	44	+ 5
„ Great Britain	—	365	+ 365
† Total	303	484	+ 181
From Germany	182	169	− 13
„ Great Britain	19	148	+ 129
Electric light carbons and electrodes :—			
Total	5,614	6,817	+ 1,203
From Germany	3,653	4,302	+ 649
„ United States	1,108	1,281	+ 173
„ France	379	959	+ 580
„ Austria	280	49	− 131

* Ordinary imports (*i.e.*, not under special treaties).
† Imported under special treaties.

Exports.

	1926. (1,000 Cwns.)	1927. (1,000 Cwns.)	Inc. or dec. (1,000 Cwns.)
Dynamos and electric motors, transformers, convertors, &c.:—			
Total	12,522	15,128	+ 2,606
To Germany	986	1,112	+ 126
,, Austria	3,759	3,005	− 754
,, Poland	680	127	− 551
,, Jugo-Slavia	2,054	2,680	+ 626
,, Rumania	671	207	− 464
,, Bulgaria	18	786	+ 768
,, Latvia	366	16	− 350
,, Turkey	491	—	− 491
,, Soviet Russia	—	2,623	+ 2,623
,, Italy	—	1,087	+ 1,087
Wireless apparatus:—			
Total	946	2,428	+ 1,482
To Poland	437	913	+ 476
,, Germany	161	326	+ 165
Electric measuring and calculating apparatus:—			
Total	2,120	1,984	− 136
To Germany	1,254	902	− 352
,, Poland	186	38	− 148
,, Austria	490	522	+ 32
Switches, fuses, &c.:—			
Total	2,859	2,566	− 293
To Great Britain	878	316	− 562
,, Poland	649	1,216	+ 567
,, Rumania	443	42	− 401
,, Turkey	109	48	− 61
,, Italy	311	55	− 256
Incandescent electric lamps:—			
Total	13,504	25,352	−11,848
To Free Port of Hamburg ...	1,907	2,220	+ 313
,, Germany	2,431	10,319	+ 7,888
,, United States	2,494	1,871	− 623
,, Belgium	1,361	807	− 554
,, Great Britain	3,316	5,585	+ 2,269
,, Argentina	214	409	+ 195
,, India	8	743	+ 735
Mounted lampholders:—			
Total	1,672	1,318	− 354
To Poland	400	2	− 398
,, Austria	150	574	+ 424
,, Great Britain	167	15	− 152
,, Germany	151	655	+ 504
,, Jugo-Slavia	123	1	− 122
,, Rumania	116	—	− 116
Electrical apparatus, unspecified:—			
Total	5,827	9,099	+ 3,272
To Austria	1,344	1,138	− 6
,, Germany	1,823	1,377	− 446
,, Jugo-Slavia	528	343	− 185
,, Great Britain	244	2,535	+ 2,291
,, Hungary	223	266	+ 43
,, Poland	390	572	+ 182
Electric wires and cables:—			
Total	5,775	11,672	+ 5,897
To Poland	1,275	1,713	+ 438
,, Belgium	376	294	− 82
,, Rumania	1,836	3,217	+ 1,371
,, Jugo-Slavia	92	1,759	+ 1,667
,, Great Britain	1,167	1,689	+ 522
,, Germany	454	1,350	+ 796

The Evolution of an Electric Fire.

Some Secrets of Design.

IN the early days an electric fire was not a thing of beauty. More often than not it consisted of a very substantial, too-substantial, cast-iron frame in which were mounted slabs of fireclay bearing coils of wire which had a marked sagging tendency. Nowadays this is all changed; many electric fires are works of art, and all of them have to be as trouble-free as possible and efficient. Consequently the designing of electric fires has become a specialist art, and haphazard methods are no longer tolerated.

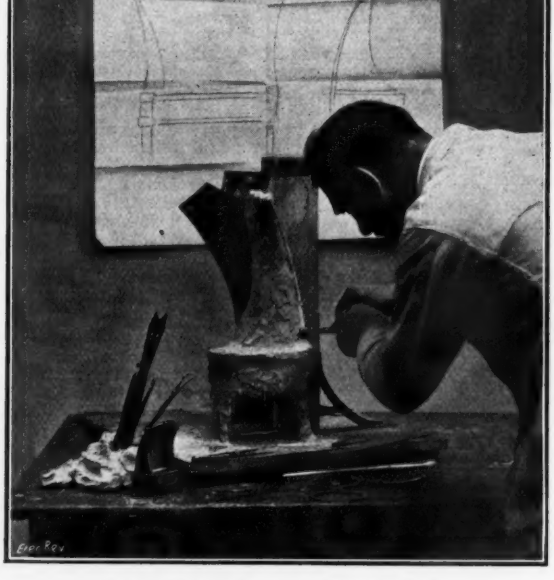


Fig. 1.—Modelling an Electric Fire.

Some idea of the care which is bestowed upon the production of a new fire is conveyed by the accompanying illustrations which have been sent to us by Messrs. Pest & Lloyd, Ltd., Handsworth, Birmingham. Rough sketches are first made to obtain an idea of proportions and general shape. A great deal of attention is given to the curves, particularly to that of the reflector. The latter is designed to throw the heat forward and to emphasise this the lines curve outward at the top, as viewed from the front. The curve of the reflector is accurately determined by bending a quarter-scale piece of polished sheet metal to the required shape. The shape is obtained by placing dummy elements at the base of the reflector, which is then bent until the reflection of the elements fills the whole of its surface when viewed from the usual angles. A quarter-scale wax model is then made and shaped into gentle curves and contours corresponding with the lines of the reflector. The next step is to get out a full-sized drawing based on the wax model, and a casting pattern is prepared. Fig. 1 shows the modeller at work with the sketch pinned to the wall and the quarter-scale model in front of him. The

Fig. 2.—The Finished Article.

casting pattern is first produced in clay and modelled on a sheet of metal of the same size as, and curved like, the reflector, held in position by a wooden frame. As the modeller proceeds, he improves the design and gives it more "life." In this case the proportions have been improved by lengthening the legs, while in the curves of the sides a certain grace and spring has been achieved which is slightly reminiscent of a yacht's sails. Fig. 2 presents two views of the completed fire. It should be noted that the elements are at eye-level. Viewed from above the reflection of the elements spreads over the whole of the reflector, giving a solid red glow when the current is switched on.

The National Radio Exhibition.—I.

Some Impressions of the Show, and brief Details of the Newer Apparatus on View.

THE advent of the National Radio Exhibition heralds the approach of the busy season of the radio trade, for its business is done mainly between the months of September and March. The industry is not subject to the usual laws of supply and demand upon which most of the staple industries rely: accordingly, not only are the wholesaler and dealer anxious to determine what incentive the manufacturer is likely to offer by way of pre and post sales support, but also the purchasing public is keenly awaiting the manufacturers' revelation of what he has to offer for the new season. A visit to the London Olympia show (September 22nd to 29th) will satisfy both desires, reveal the past year's progress to have been solid, and indicate the degree of stabilisation that has now been achieved by the industry.

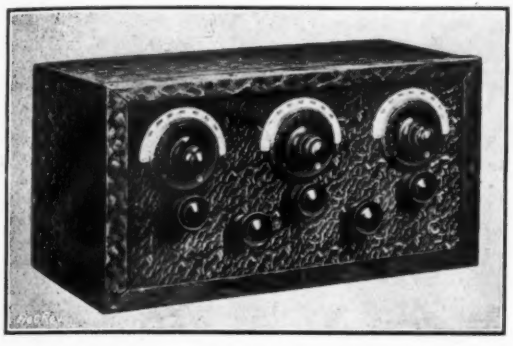


Fig. 1.—Mains-operated 3-V Set in Fabric Case.

The space allotted to exhibitors by the Radio Manufacturers' Association has been increased from the 340,625 sq. ft. of last season to 400,432 sq. ft., which has provided accommodation for about 264 stands on which the products of some 180 firms are displayed, and the R.M.A. has decided to supplement and develop its exhibition work by repeating in the larger provincial cities what is now being done in London; the Association will take a leading part in the Manchester exhibition in October.

The show is comprehensive and practical; quality and design of apparatus continue to improve, and the recent abatement of Marconi patent royalty charges has resulted in a general reduction of prices which has placed the more efficient and elaborate equipment within the reach of a much wider public.

Really efficient apparatus, properly marketed and intelligently demonstrated, is stimulating the public's appreciation of faithful reproduction, which implies the use of higher voltage and larger current: whilst the demand for battery-operated receivers will probably never cease entirely, the "all-from-the-mains" outfit has definitely come into its own, and numerous adequately designed devices for deriving energy from the domestic electricity mains are now available. The pursuit of quality is naturally governed by the loud-speaker, the development of which is proceeding apace; not only is the coil-driven pattern now obtainable in greater variety and at far lower prices than last year, but also the reed-driven cone has been much improved, it having the advantage of not needing excitation (as distinct from driving) current; one make of the latter type is even declared to be comparable with the moving-coil speaker so far as performance is concerned. Last year's novelty, *i.e.*, the screen-grid valve, has been introduced by several manufacturers into the high-frequency stages of their receivers with a material gain in amplification, stability, and simplicity of control. This season's innovation, *i.e.*, the "Pentode," is a five-electrode valve primarily for the output stage; it may be described as a screened valve with an additional earthed screen grid between the screening grid and the anode. The third grid prevents a detrimental interchange of electrons, bombarded out of the anode and caught by the screening grid, resulting in a remarkably wide range of undistorted output; the characteristic is claimed to be substantially linear for a total grid swing up to about 15 volts, for which swing the anode current variation should amount to some 16 mA, which should suffice for the average speaker.

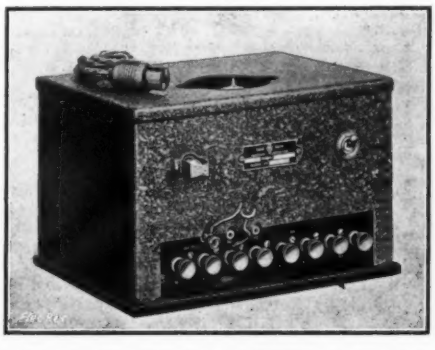


Fig. 2.—Model "B" Eliminator, H.T., L.T. and G.B.

Fig. 3.—"Elastic" Aerial Unit.

As will be appreciated from our review of the newer sets and components, which is commenced overleaf, the assumption that few striking innovations are to be seen at a wireless exhibition has become a truism, and this season's show is not an exception to the rule: nevertheless, a long queue formed as early as 6 a.m. outside Olympia to gain admittance at 11 a.m., and a crowd has thronged the hall each day. Every visitor is a potential purchaser, and the increased knowledge he is bound to acquire by the inspection of exhibits is sure to help towards a better understanding of the functions of the component parts of receivers and associated apparatus, and thus sooner or later lead to increased sales, by stimulating a desire for more up-to-date apparatus.

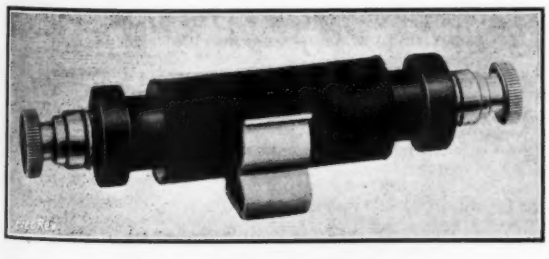


Fig. 4.—High-frequency Choke.

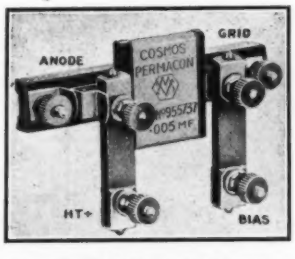


Fig. 5.—Skeleton Resistance Coupler.

Metro-Vick Supplies, Ltd.

Perhaps the most prominent feature of this exhibit is the amount of attention given to mains-operated sets, and they can be obtained either complete, or, for the constructor, the individual component parts can be purchased with full details for assembly. The company has also introduced an inexpensive fabric case (fig. 1) to give these cheaper sets a tidy appearance and keep out dust. The new model "B" eliminator (fig. 2) combines all three in one container, and another feature which is attractive is that the component parts of eliminators can be purchased separately. Of "Cosmos" a.c. and rectifying valves there is a considerable display, as well as of the ordinary battery-operated valves. Perhaps the exhibit which will attract most attention, introduced for the first time, is the Met-Vick "Elastic" aerial unit (fig. 3), which provides the equivalent of being able to reduce the length of the aerial from its maximum to zero in infinitely fine gradation, so that the maximum sensitivity and selectivity can be obtained when interference is being experienced. The unit is made for various methods of mounting and not the least of its attractive features is that it affords a means of most excellent volume control. The special hospital set in an oak cabinet which is exhibited is similar to the recent very successful installation at the Lodge Moor Hospital, Sheffield. The company is also showing examples of its new short-wave 3-valve set, with resistance-coupled low-frequency stages, specially designed for the colonies. Other interesting components are the h.f. choke (fig. 4) for baseboard mounting and the skeleton detector and r.c.c. coupler (fig. 5) with moulded anode and grid resistances:

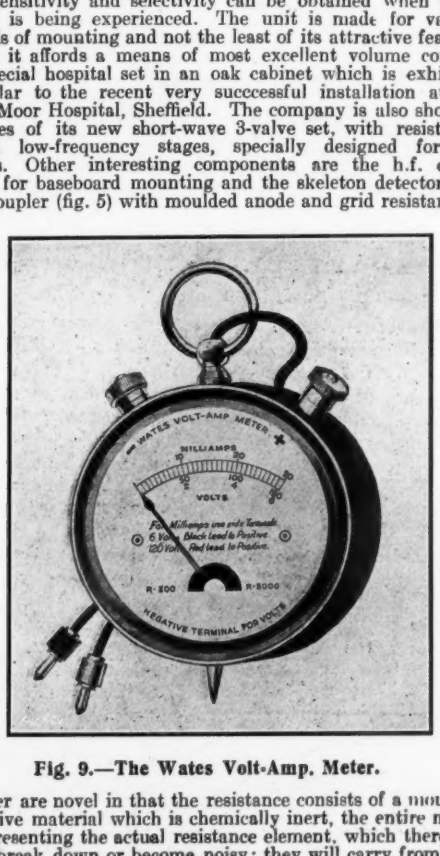
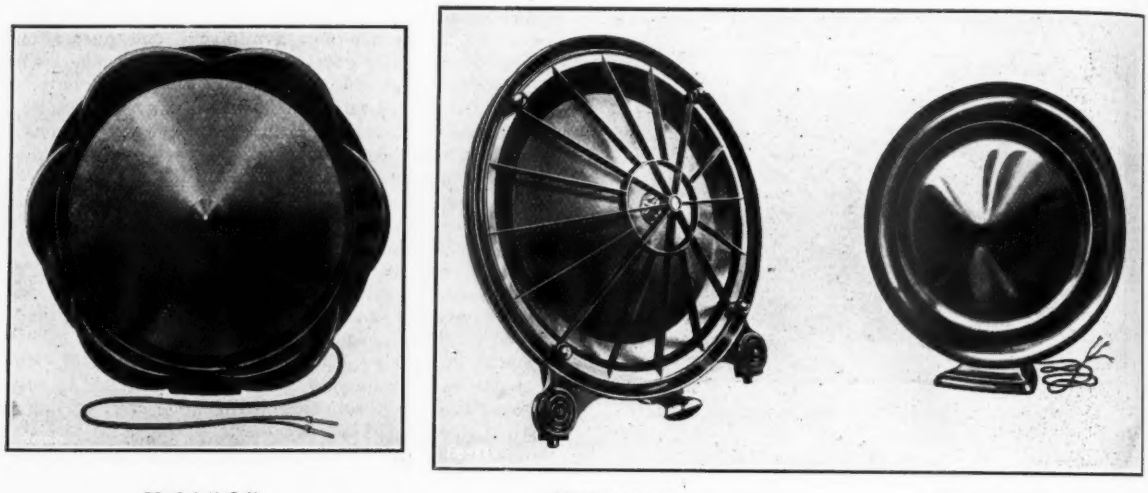


Fig. 9.—The Wates Volt-Amp. Meter.

the latter are novel in that the resistance consists of a moulded conductive material which is chemically inert, the entire material representing the actual resistance element, which therefore cannot break down or become noisy; they will carry from 5 to 10 mA and are of guaranteed permanency.

Mullard Wireless Service Co., Ltd.

On this company's stands a comprehensive range of valves is to be seen, including the screen-grid and "Pentone" varieties; the latter is of the five-electrode type, having a very large amplification factor, and is essentially a power valve; when used in the last stage of a receiver immediately following the detector it will give approximately the same output as two l.f. stages comprising an ordinary valve and a "super-power" valve. An interesting introduction is the new Mullard speaker (figs. 6, 7, and 8), models "C" and "H": both retain the balanced-armature principle of construction, model "C" being a smaller edition specially made for use either on a table or other flat surface, or to be suspended from a wall. Model "H" is a much larger speaker, suitable for the largest receivers. Besides accessories, of interest to amateur transmitters is the range of modulating and transmitting valves of from 10 watts up to 10 kilowatts, including the new series of low- and high-power transmitting valves specially designed for short-wave work.



Model "C." Model "H." Model "E."

Figs. 6, 7 and 8.—Mullard "Pure Music" Speakers.

Standard Wet Battery Co.

The batteries are now assembled in wooden "Uniblock" containers holding 32 cells, giving a maximum of 48 volts, so that the trays can be mounted one above the other. The jars are moulded glass, and the chemicals for making the fluid electrolyte are now supplied in cartons containing all the ingredients, instead of separately as hitherto. A new product is Wates's volt-amp. meter (fig. 9); as its name implies, the instrument gives three readings on one dial: 0-150 and 0-6 volts, and 0-30 mA, the high-voltage scale having a resistance of 5,000 ohms. The screw terminals are employed for current measurement and the flexible leads and point for voltages; the movement is dead-beat and the accuracy quite satisfactory, as we have ascertained by comparing a sample with a high-grade instrument. The metal case is crystallised black finished, the dial is aluminium, and the fittings nickel-plated. It is the first small meter to be marketed at a very moderate price and giving the three readings on one dial.

Philips Lamps, Ltd.

This company has entered the receiver market with a set at a competitive price: neat in appearance, it is designed to operate in conjunction with batteries or eliminators equally well and it does not re-radiate. In the h.f. stage a screen-grid PM.14 valve is used, the detector is a PM.4D and in the l.f. stage a PM.24 "Pentode" is employed. The coils are incorporated in the set and brought into action by means of a switch, covering ranges of 200-400, 300-600, and 1,000-2,000 metres. The loud-speaker is of the balanced-armature cone type, but an unusual feature is the provision of a device controlled by a switch to enable the user to adjust the volume and tone. The company's l.f. transformer is remarkable in that it is no more than 2 in. high and weighs but a few ounces, being accordingly eminently suitable for incorporation in portable receivers. It is "little and good," having a ratio of three to one, and its amplification between 200 and 10,000 cycles is claimed to be quite constant; at 50 cycles it is stated to be well over half the maximum, while beyond 10,000 it rapidly diminishes, so that intermediate h.f. oscillations are not magnified.

Fuller Accumulator Co. (1926), Ltd.

Besides filament accumulators in glass, ebonite and celluloid containers, "Block" type cells, and high-voltage anode batteries, "Sparta" cone and horn speakers are on view. The company is also showing for the first time a reasonably-priced trickle charger: known as the "Balkite," it is a tantalum rectifier with a special electrolyte that does not attack the electrodes and is not liable to crystallise or creep. The transformer will stand heavy overloads and protects the battery, which cannot discharge into it or short circuit. No inductive hum is perceptible, even if the charger is allowed to remain in operation while the receiver is functioning.

The British Association—IV.

The Glasgow Meeting.

The Influence of Engineering on Civilisation.

By SIR WILLIAM ELLIS, G.B.E., D.Eng.

(Abstract of Presidential Address to Section G.—Engineering.)

EACH branch of engineering has added its quota to the comfort of our lives, and it may be claimed that no other profession has so direct an association with our modern civilisation. The enormous increase in population during the nineteenth century, coupled with the segregation of that population in industrial centres, arising out of the extraordinarily rapid development of industry in this and other countries during that period, has introduced new problems in connection with health and transport, and it has been the task of engineering in its many branches to deal with these problems.

The introduction of railways and of steamers during the first half of the nineteenth century led the way to an enormously increased demand for coal, iron and steel, and as the inventions of Sir Henry Bessemer and Sir William Siemens for making steel were developed, the necessity was evident to engineers and chemists for training schools to deal with the physical and technical problems involved in engineering and metallurgy, so as to arrive at a far greater accuracy, both in design and construction, than had been considered necessary or possible.

The technical societies in this country realised that special attention would have to be devoted to an education which would combine a practical knowledge of engineering with a course of technical education of a high level. This was also associated with a preliminary examination to ensure that their students should have a sufficient grounding in general knowledge to enable them to apply themselves with success to the more intricate technical problems incident to their profession. This action on the part of these institutions has been fully rewarded by bringing into existence a body of highly trained engineers with special knowledge of the different branches of engineering, and, therefore, well able to lead our profession forward in the great developments which are still taking place in all branches of engineering.

Throughout the world will be found monuments to the skill of the civil engineer, and the very existence of the population in our large cities in health and comfort is the result of his work, for without an ample and reliable supply of water of good quality, and an efficient drainage control, our death-rate would be very different from what it is. The prosperity of India and Egypt largely results from the magnificent irrigation works which have been carried out there.

The large increase in tonnage of ocean-going vessels has resulted in the necessity for larger docks and harbour basins, and the development of railways all over the world, many of them in difficult mountainous countries, has given the civil engineer a great opportunity in designing bridges for carrying this heavy traffic.

The development of the potential wealth of any country depends mainly on the means of transport; I allude especially to the great corn-growing countries where the home consumption bears only a small relation to the possible production. The knowledge that there is efficient transport both by rail and for export by sea is the greatest incentive to the farmers to spend money in extensive cultivation with the certainty of a ready market for such production.

The comparison of travel to-day, both by land and sea, with my early journeys in Europe nearly fifty years ago, emphasises in my mind how much we are indebted to the engineer, in the way of personal safety and comfort and also prompt delivery of our products. The comfort and safety of modern travel is to my mind one of the glories of modern civilisation.

On looking back a few years to the old system of horse-drawn tramways, we must surely be grateful for the benefit accruing to many thousands of our working population arising out of the introduction of electric tramways, enabling them to live in many cases in much healthier surroundings.

This country has undoubtedly been the pioneer in the building of large warships and liners, also in the development of the very large horse-power therefor. The considerable increase in the tonnage of ships brought with it the necessity for a corresponding increase in the mechanical appliances in connection with their construction. Triple-expansion engines held their own for a considerable period, and it was the trials of the *Turbinia* which brought about the first change from this method to the steam turbine. The introduction of geared turbines brought about valuable economies, and helped the turbine principle to maintain its reputation. The development of internal-combustion engines for marine purposes has made great strides in recent years; a horse-power of 36,000 on four propellers has already been achieved with efficiency. The question of larger horse-power and/or electrically driven ships is one of the problems to which marine engineers are at present turning their minds.

In the mercantile marine the developments which have taken place result in very much greater comfort at sea. Shipbuilding and marine engineering have indeed taken a noble part in assisting the march of civilisation and adding to our comforts in every possible way.

Although numerically, I suppose, the mechanical engineers exceed the numbers of any other branch, nearly all their duties are associated with other types of engineering. In connection with civil engineering, all the plant occupied in harbour, dock, and railway construction is in the hands of the mechanical engineer. Also in transport and marine engineering the mechanical engineer is largely engaged in the building of locomotives and marine engines and auxiliary machinery.

In electrical engineering, although this branch no doubt includes engineers without mechanical training, I venture to say that the engineer is in an infinitely stronger position if he has received some training first as a mechanical engineer and has specialised in electrical engineering afterwards.

Machine-tool construction has made very great strides and introduced many changes of design to meet new requirements. We hear very strong rumours of the advent of a new type of tool steel, if it can be called steel at all, which is going to bring about a greater change in output than was represented by the introduction of high-speed steel some years ago.

Those of us who are conversant with coal-mining matters realise how much science and engineering have done to lessen the risks under which the miners work. The careful supervision of winding arrangements, inspection of ropes, and general regulations for the safety of the men are such that only one man in forty millions suffers an accident from this portion of the miner's duty.

Underground haulage is largely carried out by compressed-air engines placed underground, as in many pits it has not been felt safe to introduce electric power for the purpose except in the immediate neighbourhood of the shafts. It is true that the electrical engineer has gone a long way in lessening the liability to sparking, and in enclosing the motors so as further to lessen this risk. We are still left, however, with possible danger caused by the cables along the main roads, which however carefully placed are still liable to be damaged by unexpected falls of roof, thereby introducing a potential danger which is difficult to eliminate. At the coal face the engineer has not been able to do much to lessen the hard manual labour of the working miner, but in thin seams coal-cutting machinery has lessened enormously the manual work of the miner.

Electrical engineering covers a very wide range of subjects and affects our social life almost more intimately than any other type of engineering, except perhaps the supply of good water and efficient drainage installations. In considering this branch of engineering as a whole I find it very difficult fairly to divide the credit for its development between the pure scientist and the engineer. No electrical engineer to-day can possibly efficiently carry out his duties without a greater knowledge of pure science than may be regarded as essential in other branches of engineering.

The introduction of wireless telephony and telegraphy has amazed the world to a greater extent than that of the telephone; it is impossible to say what number of lives have already been saved by boats in distress having been able to secure help by means of wireless communication.

The development of electricity as a mechanical driving power was very slow up to a certain date. Electric driving on main-line railways is still under discussion. The only country which has wholeheartedly adopted this system is Switzerland, a country which has undoubtedly been influenced by the uncertainty of obtaining a uniform supply of coal at reasonable prices, coupled with the fact of an efficient and ample supply of water power for its generating stations.

In this country considerable developments are taking place on the various main lines, but engineers are at present concentrating on the use of electric driving mainly for suburban traffic, and not at present on main-line long-distance expresses. It is probable that the great extension of high-power installations throughout the country contemplated by the Electricity Commissioners will render possible a more extensive use of electric trains on our main lines.

The application of electricity for driving purposes in the various large works in this country made very rapid strides as soon as electrical machinery for the purpose was available. Few engineers realised that electric driving would replace so rapidly the existing methods. Apart from the economy represented by its introduction, the change enabled the management to register the amount of power used by each type of machine under varying loads. The greater efficiency, however, is really represented by the fact that in a large works electricity can be produced in bulk at a central power station at a low cost, and the loss in distributing to the various departments through high-tension cables and transforming to lower voltage in the different sections of the works is insignificant

compared with the saving represented by a consumption of coal and a cost of maintenance far below what is possible with direct steam driving.

The public, I think, fails to realise that electric lighting for domestic purposes, if charged at a reasonable rate, does not represent any real charge on the household. It is so clean in its application that, in my opinion, the necessity for cleaning and decorating which is avoided in many cases represents a greater saving than the amount paid for electric light. In addition we have the great advantage that it does not burn oxygen, and therefore we have more healthy conditions in our rooms compared with any other method of lighting. I feel sure that those who have introduced electricity into their houses for the purpose of cooking and hot-water supply will never go back to the old system of kitchen fire for this purpose, owing to the former's efficiency and cleanliness in application. It appears to me that all that is wanted for a much larger use of electricity domestically is a reduced charge by the various supplying companies and corporations, at least to the level which exists in many of our cities already.

Those of us who are spending our lives in engineering work may justly be proud of the large share the members of our profession are taking in promoting and advancing the civilisation of the world, and thereby bringing happiness and prosperity to many thousands of our fellow countrymen.

Electrical Terms and Definitions.

(Discussion in Section G.—Engineering.)

A report was to have been presented on September 12th by the Committee which was formed in 1926 (following the publication by the British Engineering Standards Association of a Glossary of Terms used in Electrical Engineering) to consider, and if possible to arrive at some agreement on, definitions of electrical terms. The Committee, however, had not prepared a report, owing to differences of opinion which had arisen, but there was a discussion to give an opportunity for further expressions of view. Professor J. D. Cormack presided.

Professor Sir J. B. HENDERSON (chairman of the Committee), who opened the discussion, said that a fundamental problem had arisen in the discussion relating to difference of potential. It had become so customary to measure differences of potential by means of voltmeters and other instruments that one was apt to forget that these did not measure potential differences under all circumstances, and, therefore, it was difficult to define differences of potential by means of the measurements by instruments We must clearly distinguish between the definition of a quantity and its measurement. In many branches of physics the measurement of the quantity could not be obtained directly from the definition. We had to adopt roundabout methods of measuring what was easily defined physically.

Professor C. L. FORTESCUE, in a written communication, said that certain divergences of opinion had arisen from the question as to whether certain concepts often used in connection with the fundamental quanties were essential parts of the theory, or whether the concepts were merely analogies used to simplify the explanation of the quantities themselves. His own view was that these concepts were merely analogies and were not essential parts of the theory. The difficulties had arisen mainly over the definitions of displacement and magnetic flux. The definitions of the flux densities, of permittivity and permeablity and of the unit tubes were also involved to a lesser degree. It was very usual to look upon the forces and fluxes as being analogous to stress and strain and to regard the fluxes as being effects caused by the forces. Many writers even regarded them as being of different physical natures and related to one another by quantities—the permittivity and permeability respectively—which were of unknown physical dimensions. These were no more than illuminating analogies. Another very commonly held view was that the fluxes in material media were in some way different from those in the ideal perfect vacuum. It was not clear what the difference was or why there should be any difference. In his view there were two states, *viz.*, the electric field and the magnetic field. The so-called "forces" were the measures of the intensity of these fields as given by the mechanical forces per unit acting on indefinitely small charges placed at the points in question. A unit tube of force was one having a definite value for the surface integral of the field intensity over its cross-section normal to the direction of the field. Whether this was unity or 4π was a matter of convention. The aggregate of the number of these unit tubes under consideration was the flux and the number of these tubes per unit area was the flux density, which by definition must be the same as the intensity of the field. The definitions of potential followed in the usual way. In an electrical condenser with a perfect vacuum between the plates and with a certain charge there would be a certain distribution of field, and the line integral of the field strength gave the potential difference between the plates. With a solid insulating medium a complex field existed, with the result that for the same condenser and the same charge the line integral of the field strength was reduced inversely to the permittivity of the material. Whether in a perfect vacuum or in a material medium, a rate of change of electric flux density was equivalent to a current. When a magnetic material was placed in a magnetic field there were two components of the resulting field: one due to the magnetic source external to the magnetic material, and one attributable to some action of the magnetic material itself under the influence of this applied field. The resultant of these two fields was the actual field giving rise to external effects by means of which it could be measured, but was not the actual field existing at every point —no means were known of measuring this. The whole of the usual electric and magnetic theory followed directly, the only innovation relating to the introduction of the permittivity in the denominator of the expression $\xi=4\pi D/\xi$. He always introduced the reservation that the ξ referred to was a mean value over a length of path through the insulating material, which was large compared to the size of the constituent particles of the medium, and not the intensity at any particular point. If his views were correct, much of the criticism levelled at the B.E.S.A. Glossary was unjustified and many of the proposed new definitions discussed were unsatisfactory.

Professor G. W. O. HOWE pointed out that the difference of opinion which existed was not peculiar to this country. An exactly parallel struggle had been going on for years in France, Germany and the United States. He believed the difficulties sprang from the circumstance that there were very few experimental facts, and the terms used in electrical engineering were very largely based on concepts built up to explain these facts. Different people therefore formed different mental pictures, and as a result, terms and symbols had come to connote different conceptions. If the glossary had been drawn up on any consistent scheme he would not have opposed it, even if it were a scheme which he did not agree with altogether, but the people who had drawn it up had tried to fit in some new views with the old views.

Professor E. W. MARCHANT, dealing with the nature of permeability and permittivity, said that when defining the two quantities generally denoted by B (flux density) and H (magnetising force) it was usual to express them both in terms of the strength of a magnetic field in a certain space. Permeability was defined as the ratio between these two quantities. and it was often assumed that, since both of these quantities were measured in terms of the strength of a magnetic field, they must be of the same nature and that the ratio between flux density and magnetising force was a number. In the same way, permittivity might be defined as the ratio between the strength of the electric field in an infinitely thin crevasse cut normal to the direction of the lines of electric force, and the strength of the electric field in a long narrow hole cut along them. The assumption that these two quantities were numbers was wrong, and he went on to try to visualise the state of affairs existing in the medium in order to demonstrate the essential difference in the nature between B and H and between D and electric force. Taking, first, the case of the magnetic medium, he said the magnetising force acting on a piece of iron was generally represented by lines of force, these lines being drawn in such a way that the number of them through unit area normal to their direction was equal to the strength of the magnetising force. As soon as a piece of iron was placed under the influence of this magnetising force it became magnetised, and according to the theory that was now usually accepted, the magnetisation was produced by turning round a number of molecules of the substance (which were permanently magnetised by the motion of the electrons in them). If one considered an infinitely thin crevasse cut through such a material, the resultant magnetic field existing in the crevasse depended (1) on the original magnetising force, and (2) on the magnetising force produced by the magnetised particles. If it were assumed that these magnetised particles were set in line, one could imagine that there was a string of lines of force coming from the north pole of one particle to the south pole of the adjacent particles, and these lines of force (if one could use that expression) were "generated" by the magnetisation of the particles; so that part of the magnetic field across PP was due to the magnetising force H, and part of it to the induced magnetisation produced by the magnetised particles. The distribution of the magnetic field across PP would be non-uniform, but it was evident that the total number of lines of force across the space would be increased on account of the additional magnetic fields that were produced by the magnetised particles. The strength of the fields so produced would clearly depend upon the magnetised particles, *i.e.*, it would depend upon the reaction between the magnetising force and the magnetised particles, which were assumed by Evershed and others to be current rings. It was to most people inconceivable that a reaction between H and the magnetised particles could be produced without the existence of some intervening medium, and it was through the intervention of this medium that the rotation of the magnetised particles was effected. It was clear from this that the strength of the magnetic field which was due to the magnetised particles must depend on the medium in the space surrounding these particles. Although permeability might be expressed as a number, therefore, it was essentially a quantity which depended on the properties of a medium when subjected to forces which produced magnetisation. In exactly the same way we could regard the electrostatic field as producing certain changes in what Faraday had called the polarised particles of a dielectric. There was a difference between the magnetised particles and the electrically polarised particles in this respect, that the polarised particles due to an electric field were not caused by the turning of permanently electrically polarised particles but by the distortion of the orbits of the electrons which were rotating in these particles. The distortion of the orbits of the electrons produced the equivalent of an electric doublet which in its electrical properties corresponded very closely with the magnetic properties of the magnetised particles or current rings. It was clear, however, that the electrical moment of the polarised par-

ticles in a dielectric depended on the medium which transmitted the electric force to them. If, therefore, we measured the strength of the electric field in a crevasse cut through the dielectric normal to the lines of electric flux we should measure an average value of electric field strength which would depend on the number, distribution, and polarisation of the polarised particles. Hence permittivity also was a property of the medium surrounding these polarised particles. The permittivity or specific inductive capacity of a substance, therefore, depended essentially on the behaviour of this medium when transmitting an electric force. Although permittivity from one point of view, therefore, might be regarded as a number, it was essentially a quantity which depended on the properties of a medium when transmitting electric forces.

Prof. F. G. BAILY said he had endeavoured to draw up something equivalent to the first dozen pages of the B.E.S.A. Glossary, which pages were devoted to the fundamental electrical terms. There was great difficulty in drawing up any set of definitions, because, while the professors felt that they must be philosophically accurate, at the same time, if their definitions were to be of any use, they must not only deal with the wording and ideas used by practical engineers, but must fit in with the way in which the practical engineers used their expressions. A good deal of the difficulty was experienced in endeavouring to meet both sides, because the practical man used words in a way which he found convenient to himself, regardless of whether they were philosophically accurate or not.

Prof. W. CRAMP, after discussing with Sir James Henderson some of the points raised, said it was apparently agreed that the crevasse slot system would give a reasonable basis on which the Glossary might be framed. He asked if others agreed with that view.

Sir JAMES HENDERSON replied that he did, and Prof. CRAMP said it seemed to him that that was the solution of the problem so far as the Glossary was concerned.

Standardisation: Its Economic Basis.

By C. LE MAISTRE.

(*Abstract of a Paper read before Section F.—Economics.*)

In the course of this paper the author said that engineers of this country and many progressive business men were, generally speaking, converted to the benefits of standardisation carried out nationally with the strictest precautions to prevent interference with invention and design and with proper arrangements for review and revision when practical experience and progress dictated. It was, however, a question as to the extent to which the economic value of standardisation was realised by the management and the directors of the various firms. Since the war the producing countries had all, to a greater or less degree, been forced by economic pressure and the hope of increasing their export trade, to give far greater attention to this subject than hitherto, and no country had given it greater attention or more publicity than the United States. In 1926 it was estimated that over one and a half million pounds was expended in that country on standardisation, and there were five national standardising bodies, over 190 trade organisations, and over 50 Government Bureaux doing standardisation work of one sort or another. In Europe, whilst we in this country had the oldest national organisation, Germany had probably the largest scheme of standardisation and was influencing the whole of the Continent in that direction. Czecho-Slovakia—one of the youngest republics—had for its size, probably as active a standards organisation as any country, the manufacturers financially supporting it to a far greater degree than in most other countries. Russia had recognised the economic value of standardisation, particularly in connection with exportable raw materials where proper grading was necessary for profitable marketing, which could only be reached through standardisation. No movement had ever been so hampered by its title as standardisation, for the term lent itself to so many interpretations. It was often thought to imply crystallisation, whereas the movement, at any rate in this country, stood for an entirely progressive and co-operative effort. It was well to distinguish between dimensional standards and those of quality, rating, performance and tests, the latter of which enabled comparisons of tenders to be made. A further division—a somewhat arbitrary one—of simplification had also to be considered.

The American Government, up to the present, appeared to have regarded simplification as the more commercial part of the process dealing solely with the reduction of the variety of types to the least possible number. Industrial standardisation, according to the experience of the B.E.S.A., provided an equitable basis for the comparison of tenders by simplifying and standardising both on the production side as well as on the commercial side, thus benefiting both the producer and the consumer. The very first piece of work of the B.E.S.A., over a quarter of a century ago, was that of simplifying the large variety of steel sections then being made. These were finally reduced to 113, thereby saving, at that time, 5s. per ton or a million a year.

It is quite probable that in America it might be found expedient to make less and less distinction between the two processes. In this country experience had shown that with the community of interest of purchaser and producer recognised, simplification practically always led to agreement on industrial standards. He was convinced from experience that to reach the most economic results the work must be carried out nationally. It would also seem that the greatest benefits were likely to accrue in those industries which were well organised. The success of the B.E.S.A. was in large measure due to its recognition from the outset of the community interest of producer and user. In this country dimensional standardisation had not been carried so far as on the Continent. Interchangeability coupled with drastic simplification had contributed very largely to the success of the American automobile industry. Surely what was true of the motor industry must be true of other industries, at any rate to a considerable extent. In this country because of our geographical position our manufacturers lived largely on diversity, and we were probably unable to undertake a huge scheme of simplification such as the American with any possibility of economic success. On the other hand, a very great deal could be done through closer contact between the technical and commercial departments of all our firms. In conclusion, the author said that it must be remembered that too much simplification and standardisation involved the danger of sterilisation.

High-frequency Railway Traction.

(*Discussion in Section G.—Engineering upon Prof. W. Cramp's Paper.*)

Opening the discussion upon this paper, which was abstracted in our issue of September 14th (p. 454), Prof. G. W. O. HOWE said that, whilst he admired Prof. Cramp's courage in putting forward the proposals, they involved so many deviations from standard traction work that most people would at first be inclined to give them the go-by and forget all about them. The very suggestion of using 20,000 or 50 000 cycles for traction work was sufficient in itself to have it turned down. At the same time, past experience showed that the unpromising things in electrical engineering were likely to turn out to be very important. We had only to think of Heaviside's suggestion for improving the transmission over long telephone lines by inserting inductance in the line. At first that was thought to be so ridiculous that nobody would consider it, and it lay dormant for many years. Now it was the standard practice, and had solved the problem of long-distance telephonic communication. At the same time, he was not so sure that Prof. Cramp was right in assuming that the collection of current on tramways by means of a rubbing contact, as at present, was such a great disadvantage. In Switzerland, where main line railways were electrified to a very great extent, rubbing contact was employed, and it seemed the least of the disadvantages of electric traction. It would be an enormous advance to cut out the overhead work altogether, but merely to cut out the rubbing contact seemed a small advantage to gain for so much complication. There would surely be very great difficulties with Prof. Cramp's proposed method at crossings and junctions, even more than at present, because the difficulties of a tuned system appeared to him likely to be very considerable. Another point was that in the laboratory experiments the primary and secondary were of the same length, but in practice the primary circuit would be many miles long and the secondary circuit presumably only the length of the coach. How would it be possible, in those circumstances to get, as the author suggested, the added advantage of increasing the mutual inductance between the primary and the secondary? That seemed so obvious that he felt he must have misunderstood the point. Although it was stated in the paper that the tuning mechanism would be relatively simple, no details were given. At the same time he did not wish to appear too sceptical with regard to the paper. After all, the Poulsen arc was working up to 1,000 kW at the Lafayette wireless station, near Bordeaux, and giving an efficiency of about 50 per cent., whilst the mercury rectifier was much used in traction sub-stations, on the Continent, at any rate. In the new sub-stations for the Berlin railways there was no rotating machinery at all; there was a row of mercury rectifiers in which the a.c. at 50 cycles was converted into direct current for supply to the trains. All this showed that unpromising apparatus at first could eventually prove to be extremely valuable.

Prof. E. W. MARCHANT said he was inclined to agree with Prof. Howe that the difficulties of Prof. Cramp's system outweighed the advantages at the moment, and that the disadvantages of the rubbing contact had been exaggerated. One point in the practical operation was the difficulty likely to arise due to the heavy charging currents that would be taken by an overhead system working at anything like this frequency. With a system working at 50 or 60 cycles, the charging current was very large, and when the frequency was increased to 20,000, the charging current would be increased 4,000 times, which would be a very serious matter.

Mr. SCOTT MAXWELL said that in 1906 he carried out experiments for the General Electric Co. at Schenectady to find out the weakness of mercury rectifiers. The experiment had nothing to do with traction, but the engineers of the company were so impressed with the possibilities of the mercury rectifier in connection with the use of high-pressure single-phase current on overhead lines that they immediately set to work to see if they could develop a rectifier suitable for installing on a locomotive. Mention had been made of the mercury rectifier sub-stations on the Continent, and he did not know whether Prof. Howe would suggest that they could be transferred to the locomotive, but although the General Electric Co. had been working at the problem since 1906, he was not

aware that it had yet succeeded. The impression of the General Electric engineers was that the outlook was not very cheerful. He agreed that to eliminate only the rubbing contact in traction systems was not a big enough advantage. The real trouble with sliding contacts occurred with low-voltage direct current. With high-voltage single-phase current there were not the same difficulties because of the smaller currents to be handled. The suggestion that came to his mind from the paper was the possibility of having a wider air gap between the train and the conductor and so arrive at wireless traction.

Prof. Cramp had not time to reply to the discussion.

Rationalisation and Industrial Education.

By MAJOR L. URWICK.

(Abstract of a Paper read before Section F.—Economics.)

In the course of this paper the author discussed the significance of rationalisation, and levelled some criticism at the educational and business organisation in this country.

Referring, first, to the difficulty of defining "rationalisation," he said that in 1927 the Economic Conference at Geneva, representative of the whole of the industrialised nations, had passed unanimously a series of remarkable resolutions, to which was given the title of "Rationalisation," but it was apparent that there was a little uncertainty as to definition. Each of the developments noted by the conference in the discussions, however, attempted to eliminate some particular form of industrial waste. But each and all of these wastes were of a special kind: they were failures of competitive individualism to function effectively in its present form and with its existing range of ideas. Collectively, they constituted a tremendous departure from the pure theory of *laissez-faire*, and a departure in a new direction. These developments adumbrated entirely new forms of co-operative action between those engaged in economic activity, and a view of economic process which necessarily looked beyond self-interest, since it contemplated deliberate planning for periods far exceeding the lifetime of the individual. It was not possible to give a definition of rationalisation which referred to concrete phenomena. It was not a particular method of organising an industry, nor was it any system or device which could be shown in operation in one factory and not in another. It was at once an attitude of mind and a process. As an attitude of mind it implied the belief that a more deliberate control of world economic life through the application of scientific method was possible and desirable. As a process it involved the application of the methods and standards of science to all the problems arising in the organisation and conduct of production and distribution. Its consequences for those who were primarily interested in the education of the future generation of industrial administrators were far-reaching.

There was little question that the provision for research and education in Great Britain was inadequate. It did not meet the requirements, either of our great industrial tradition or of our minimum future needs. There were, of course, many useful and valuable institutions, particularly the Department of Scientific and Industrial Research. But research was one thing and the translation of its results into daily industrial practice was another. Directors of research in many industries found that employers were totally unable to make use of important technical discoveries owing to the inadequacy of their administrative arrangements. Instances were common where individual concerns had spent large sums in investigating questions on which full published information was already available.

In Great Britain in 1926 there were fewer than a thousand students in the institutions offering university training in industrial administration. In Germany there were 16,000, and in the United States more than 80,000. University business administration courses had not been so framed or conducted as to appeal to the best type of student, or to produce the type of young executive which business required. On the other hand, the majority of English businesses were so organised that it was extremely difficult for them to recruit and develop men who had enjoyed a university training. While the majority of our universities expressed great enthusiasm for obtaining the co-operation of business men in framing their courses of study, their practical arrangements to this end frequently left much to be desired. There was a tendency to appoint some sort of consultative committee with powers and responsibilities which were extremely vaguely defined. The personnel of such committees on the business side was all too frequently recruited, not from active administrators in the prime of their business careers, but from retired notabilities who had long ago left the executive side of their business lives behind them. They naturally inclined to press for a type of education which would produce the kind of subordinate they would have liked the day before yesterday. In the second place, existing degrees of commerce presented a variety of syllabuses only exceeded by the difference in the standard which they demanded from students. A degree of commerce in Great Britain did not indicate in any single instance that the student had reached any recognisable level of attainment in any one of the half-dozen fields of knowledge which might be regarded as the essential equipment for the administrator. The methods of teaching were equally variable. This was largely a matter of finance. The business man would not pay for education which he felt to be useless. In the majority of instances we were still tied down to the lecture hall and the scheduled examination. No effective organisation existed for comparing methods and co-ordinating the work either of the various faculties of commerce or of the numerous research, technical and professional institutions concerned with industry. On questions of management and administration there was, practically speaking, no research at all and no facilities for it.

Probably one of the chief difficulties was the idea among educationalists that the teaching of business must necessarily be purely vocational and technical. Business administration was a subject as suitable for a wide course of humane studies as history or philosophy. Business men and educationalists must come together on this problem as joint trustees for the future leadership of the nation. Only by facing the fact that education was a continuous process throughout the life of the individual, a process to which they both contributed, could they arrive at a common standard and an agreement as to how that standard might be attained.

New Electrical Devices, Fittings, and Plant.

Readers are invited to submit particulars of new or improved devices and apparatus for publication in this Section.

A Small Paint Sprayer.

"Sprayit Electrically" is a small electrically driven hand sprayer introduced in this country by Messrs. L. G. HAWKINS AND CO., LTD., 30-35, Drury Lane, W.C.2. It will, it is claimed, effect paint and any other spraying operations with results equivalent to the large installations on the market. When used with celulose it will produce the standard high finish which is obtained on motor car bodies, and it is suitable for dealing with whitewash and distemper. As shown in the illustration, fig. 1, the apparatus is of "pistol" design with a "trigger" switch in the handle and the container suspended from the nozzle. The fan, which with the driving motor is installed in the central portion, provides pressure in the container to force the paint up into the nozzle, and the necessary air-current for the actual spraying. The apparatus weighs about 5 lb. and the motor loading is 100 W. It can be supplied for the usual voltages. We have seen the equipment at work at the premises of Messrs. Speciality Sales, 14, New Bridge Street, E.C.4, who are also selling the apparatus.

Fig. 1.—The "Sprayit Electrically."

Fig. 2.—The "Orion" Washer.

A New Electric Washer.

The accompanying illustration, fig. 2, shows an unusual design of an electric washer recently introduced by the BRITISH ELECTRICAL & MANUFACTURING CO., 23a & 24, Rathbone Place, Oxford Street, W.1. The consumption of the "Orion" washer is 150 W, so that if necessary it can be run off the lighting supply. The tub of the washer is supplied complete with a special sieve which enables clothes to be boiled while the washer itself is working. A cover is also supplied so that the tub may be utilised as an ordinary boiler before the washer head is put into operation. The apparatus will hold approximately ¼ stone of dry clothes or 1 stone of wet. The vacuum principle is employed for the washing, the vacuum plunger making 105 strokes per minute; each stroke first forces

the hot soapy water through the clothes, and more soapy water is drawn back on the up stroke. The plunger operates at one side of the tub.

The "Kingdom" Iron.

The KINGDOM ELECTRICAL CO., "Ivex" Works, 34, Charles Street, Hatton Garden, E.C.1, recently commenced the manufacture of electrical domestic and other appliances. Among its products is the "Kingdom" electric iron which is illustrated in fig. 3. The standard pattern of mica element is employed in this, but the terminals are permanently connected to the element by means of a brass strip. A layer of mica over this

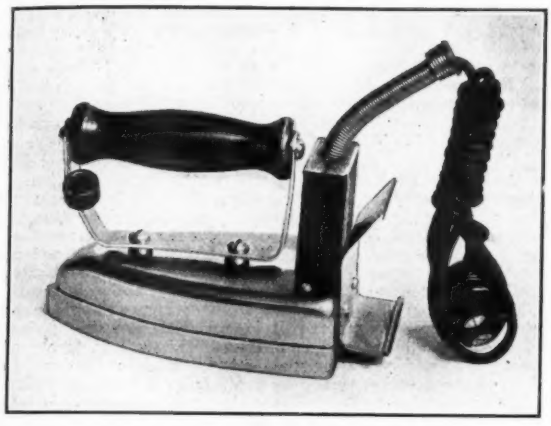


Fig. 3.—The "Kingdom" Electric Iron.

strip guards against the overheating of the connector. There is ample room for the fingers beneath the handle, and mushroom-headed fixing screws are employed to give the minimum of projection. In addition, the lower part of the handle is raised well above the body, preventing the overheating of the handle. The iron is made in five sizes and is highly nickel plated. The firm also makes a "travelling" iron for two ranges of voltage which is designed on similar lines.

A Heavy-duty Switch and Plug.

At the request of certain port authorities, Messrs. A. REYROLLE & CO., LTD., Hebburn-on-Tyne, have developed the heavy-duty switch and plug illustrated in fig. 4. This has been designed to control the electrical supply to machinery such as dock cranes, haulages, and so on, and is specially constructed to meet arduous conditions of service. The rating ranges from 60 to 250 amperes at 660 volts, double- or triple-pole, and the switches may be supplied with or without pro-

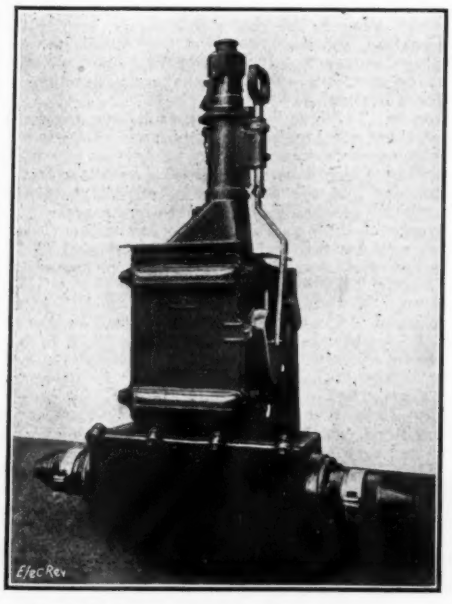


Fig. 4.—Reyrolle Dock Plug.

tecting fuses. Sound mechanical interlocks are provided to prevent access to live contacts, and provision is made for proper earthing connections through to the plant under control. One convenient method of installation is to supply from a "ring main" through a number of the units housed in pits or a subway, with the socket and switch handle accessible at the ground level, so that the plug connecting the trailing cable to the machine may be inserted into the nearest socket.

An Electric Hammer-Drill.

An electric hammer-drill is said to have been devised by Mr. Wallodi Weibull, professor in mechanics at the High School, Stockholm, and just placed on the market by the A.B. NORDISKA ARMATURFABRIKERNE, which owns the world patent rights. It is claimed that the apparatus, which can be connected to any ordinary supply circuit, will replace the pneumatic hammer for all purposes. It is proposed to form subsidiary companies to work the patents in different countries, the first of which will be in Germany in connection with the Kuntze-Knorr company.

Correspondence.

***Correspondents should forward their communications* as early as possible.** *No letter can be published unless we have the writer's name and address in our possession.*

Engineering Mathematics.

I am in agreement with your correspondent in his adverse criticism of teaching methods, and I am convinced that many students fail to pursue the above subject because of the lack of interest awakened.

Perhaps information of a manual which deals with the subject in a lucid and interesting fashion can be given for the benefit of students unable to attend classes.

Ex Maths.

September 18th, 1928.

Electromagnetic Forces.

Many electrical engineers, particularly those who are concerned with the design of circuit breakers, have need for a method of estimating the force with which two straight conductors attract or repel each other. It is generally known that this force varies directly as the product of the currents in the conductors; but the manner in which it depends upon the lengths and relative positions of the conductors is much better known on the Continent than in this country. As I am to some extent responsible for this, being the writer of the article that appeared in the *Revue Générale de l'Electricité* on May 12th last, I should now like to state some of my formulæ in a manner more convenient for English-speaking engineers, and to remark that the proofs of these and some more general formulæ were given by me in the November issue of the *Journal of Scientific Instruments*. That issue is doubtless out of print; but copies can be seen at many of our public libraries. The proofs are also given in the *Revue Générale de l'Electricité*; but the English reader of this French version of my article may need a warning as to the system of units employed. In order to simplify the mathematical reasoning, I adhered to the C.G.S. electromagnetic system throughout. This means that the currents are all in dekamperes and the forces all in dynes. If the reader wants to express the currents in amperes and to get the forces in pounds, he must introduce the factor 2.25×10^{-8} into each of that article's expressions for forces.

A designer of circuit breakers wants to know the force with which a horizontal crossbar is being urged downwards (tending to open the circuit) owing to a current of i amperes in this crossbar, in the two vertical leads and in a conductor that may be regarded (for our present purpose) as completing a rectangular loop of height h and breadth b. The formulæ here given are founded on the usual assumption that the currents can be regarded as concentrated at the centre-lines of the conductors; and b is therefore the distance between the centre-lines of the vertical leads, while h is the distance between the centre-lines of the horizontal conductors that complete the rectangle.

One would expect to find rules for dealing with this case in any book on switchgear design, or in any of the well-known handbooks for electrical engineers. But, in every such work that I have been able to consult, I have found either no rules at all or rules that are seriously misleading. Even such an authority as the American *Standard Handbook for Electrical Engineers* (fifth edition, 1922) would tell us that the repulsion between the above-mentioned horizontal conductors is

$$4.5\ (i/10{,}000)^2\ (b/h)\ \text{pounds},$$

whereas I have mathematically demonstrated from first principles, and experimentally verified from laboratory tests, that the force is actually

$$4.5\ (i/10{,}000)^2\left\{\sqrt{(b/h)^2+1}-1\right\}\quad\text{pounds}\qquad(1)$$

Applying these formulæ to the case in which $b/h=1/3$, which is a sort of case that often occurs in practice, it will be found that the American formula gives a little more than six times the actual force. The rule in Wedmore & Trencham's

Switchgear for Power Control gives more than twelve times the actual force in this particular case, giving twice as great a result as the American formula in all cases.

The total force on the crossbar consists of the force found from formula (1), together with the force due to the current in the vertical leads. A formula supposed to give the later force was put forward by Ludwig Kopec in *Elektrotechnik und Maschinenbau*, dated August 30th, 1925, and a long abstract of his article appeared in the *Revue Générale de l'Electricité*, dated January 9th, 1926. This formula is based on the assumption that h can be regarded as infinite (which is not so unjustifiable as it may at first appear), and it tells us that the force in question is

$$2.25\ (1/10{,}000)^2 \left\{ \log_e (b/r) + 1/4 \right\}$$

pounds, where r is the radius of each vertical lead. But, as is proved in my article, the correct formula is

$$4.5\ (1/10{,}000)^2 \log_e \frac{2{\cdot}57\ h/r}{\sqrt{(h/b)^2 + 1} + 1} \quad \text{pounds} \quad (2).$$

Applying these formulæ to any case in which h can be regarded as infinite (in accordance with Kopec's assumption), we find that his formula gives just half the actual force. But formula (2) takes proper account of the value of h, and in most cases it therefore gives a little less than twice the result obtained with Kopec's formula. The formulæ and rules most widely known among British electrical engineers are decidedly more misleading than Kopec's formula. In some cases they tell us that the force is more than twice what it really is, and in other cases less than half, or even less than a quarter. Forces may be misestimated to this or to a much greater extent, without arousing any suspicion of error; for many electrical engineers have no idea of the magnitude of these electromagnetic forces. In an article describing one of the bad methods here referred to, a numerical example represented the force as being 34 times as great as it actually was; and it appears that the error was not noticed until the author of that article had his attention drawn to the matter more than a year afterwards.

Since formulæ (1) and (2) give the instantaneous force when the instantaneous current is I amperes, while the expressions for the forces each contain I^2 as a factor, it will be seen that these formulæ give the average force when I is the root-mean-square value of a varying current.

W. F. Dunton.

Manchester, *September 16th*, 1928.

"Costs for Manufacturers" (Pitman's).

I quote the following from a recent review: "*the book is commended to our readers as presenting the viewpoint of the technician rather than of the theorist.*"*

In the latter part of that sentence is, I suggest, the only possible explanation for the exaggerated comments on this book in your last issue. Critical analysis of principle or method is both pertinent and instructive, but it is certainly *not* to be confused with extraordinary indulgence in a long string of "suppositions," which, I submit, betray the attitude of the theorist up against a new and practical idea.

It is astonishing that one who should be alive to modern ideas on costing should ask the reasons for allocation of space (for expense purposes) to the factor of production. "*The unit expense rate method*" based on floor space occupation is not a new idea in itself—it is fairly widely used, it is treated of in several modern books on costing, and it is sufficiently well known to have earned the term "the square-foot method." The concrete reasons in the first seven pages of the book should, in any case, have saved "*the search in vain.*"

The general arguments in favour of the method are universally recognised as sound, differentiating as it does between classes of product. Hitherto the objection to its wider adoption has been the difficulty of application. It is that difficulty that "Costs for Manufacturers" has sought to overcome with a new principle of uniting "time" and "space" occupation, by a simple and exact method of arriving at the expense rate, for each factor of production.

The comments ignore the main features of the book, and concentrate on non-essentials; even on these, the method of comment is unfair, for instance, the repeated ridicule of the sentence: "It becomes a matter for the sales manager to decide upon an increase in the price," is only possible, by deliberately tearing it from its context: "or a reduction of fixed profit, or, if necessary, sustaining a loss." Thus, one course is quoted, as the *only* choice, when *three* alternatives are given, either one of which a sales manager may employ with discretion. Again, play is made on two machines, one idle, one busy, without regard to advice given on costs for grouped machines engaged on similar work.

References are made to machines, as if their running were dependent upon the haphazard daily efforts of the salesmen. Surely normality in production is understood, by far the greater part of production is for "stock," against present and future orders, which gives reasonable continuity of work. It would be unfortunate for industry if it were otherwise. But it is in the simplicity shown of choosing, of all industries, "the textile industry" for further indulgence in speculative comment, that one is amazed. It unconsciously reveals "an association of ideas" reflected from the chaotic condition of the industry in question, and if such an attitude of thought is prevalent in the trade, then "*poor Lancashire*" is to be pitied. To select an industry, notoriously suffering from its own choice of methods is singularly inapt, all the existing conditions render the suppositions at least gratuitous, and possibly foolish. The "boomerang of ridicule" recoils upon the head of the thrower.

The textile industry obviously needs complete overhauling more especially perhaps in its costing methods. It is appropriate to quote from a letter (not mine) that appeared recently in a leading journal of the textile world:—

"*I do not think that the textile trade will be much longer content with the indefinite data from which costs have been arrived at in the past. The very serious competition of our Continental neighbours should have forced the pace long ago, and it is surprising how we accept the position so resignedly and completely, that we cannot compete with them.*"†

That *intelligent* comment, I suggest, strikes the keynote to the progressive idea that is needed in costing methods, not only in "textiles," but in many other industries, if we are successfully to contend against the developing competition of other countries. The unique conditions, which, for a century, gave sheltered privilege to such of our staple industries as cotton, steel, and coal, have passed long ago, but many of the inadequate costing methods that grew unchallenged in practically a non-competitive age remain. Their influence, too, has extended to some of our newer industrial developments.

Old and new industries alike are meeting, and will meet intensified competition, and it is essential that we displace "inadequate method and cumbersome theory" in favour of practical ideas in costing, which will achieve the end in view. In conclusion, I beg to quote from a Northern daily: "*His system appears to give manufacturers a new insight into the profit and loss sides of their business.*"‡

If "Costs for Manufacturers" does that, I am content.

Charles Smith.

London, *September 22nd*, 1928.

Electric Heat in the Garden.

During my absence, on holiday, two letters on the above subject have appeared, in your issue of September 7th, and perhaps you will grant me a little space to comment on these.

The first letter appears over the signature "Ubique," and, although it goes against my grain to waste powder on an anonymous correspondent, I wish to examine some of the statements made.

In the first place, he summarily dismisses distribution of heat through hot-water pipes, stating that it is barred out by its cumbersome nature, its heavy expense, and the short life of hot-water pipes in the soil.

As regards cumbersome nature, "Ubique" will find, on reference to Mr. R. Borlase Matthews's original article that, as a rule, the heating cables are enclosed in earthenware pipes. Why are these less cumbersome than hot-water pipes?

There is, as far as I can see, no reason why earthenware pipes should not be used for hot-water circulation. If this course were adopted, the cost would be no greater than for electric heating, and the life of the pipes would be unaffected by burial in damp earth. If, however, iron pipes are necessary, they can be protected by one of the various systems already in use for water mains.

Further on, "Ubique" alleges that I have overlooked the fact that there are hundreds of thousands of horse-power of electrical machinery which has to be kept in operation continuously but which is carrying little, if any, load for 18 to 20 hours per day. In the first place, I cannot conceive of any station which is so badly organised as to have plant running for upwards of three-quarters of the day without load; and, secondly, what has this to do with the question which I asked: "Is the use of electric heat in the garden or nursery justified in this country?"

Later on, "Ubique" states that with such lightly loaded plant a Board of Trade unit can be generated by the expenditure of 8.5 lb. of steam at a cost of one-tenth of a penny. This appears to me to be a phenomenally low steam consumption for lightly loaded plant, even when the generating sets are of a very large size; in fact, in my innocence, I had looked on 10 lb. per kWh as the very limit even for full-load conditions, but I will let this pass and compare the cost with an ordinary hot-water system.

"Ubique" states that he can deliver a kWh to the soil for 0.143d. by the combustion of 1 lb. of coal. With an ordinary coke-fired boiler, using coke at 30s. per ton, the cost of 3,410 British thermal units (the heat equivalent of a kWh) would be 0.08d., and ¼ lb. coke only would be burned. If coal at 18s. 8d. per ton were used instead of coke at 30s., the cost of 3,410 British thermal units would be only 0.05d.

If the condensing water from a steam set or the cooling water from an internal-combustion set were used, the cost would, of course, be a mere fraction of the above amounts.

I imagine that the real object which "Ubique" has in view is to advocate the claims of the "change-circuit" system,

* *Metrocol Monthly* (April, 1928).

† The *Textile Manufacturer* (July, 1928).

‡ The *Glasgow Herald* (March 20th, 1928).

since the latter part of his letter is devoted to extolling the virtues of this system. Perhaps this is the reason for his adoption of a *nom de plume*.

The second letter is from Mr. H. M. Sayers, and with this I am in entire agreement. His suggestion that the market gardener might supply himself and his neighbours with electrical energy as a by-product of the fuel used for his frames and glass houses is a valuable one and, as he says, would help to solve the problem of rural supply.

I have been responsible for schemes where the steam is first used for the generation of electricity and subsequently in the form of exhaust steam used for heating water. Such schemes show a thermal efficiency at least double, and often treble, that of our largest super-power stations.

F. J. Moffett, B.A., M.I.E.E., M.Cons.E.

Birmingham, *September 22nd*, 1928.

A Relay for Water-heating Control.

Mr. H. Wilson shows in his letter in your current issue that he is very unacquainted with manufacturing in comparing the cost of a small special instrument with that of such a mass-production job as a meter.

It may be that Mr. Wilson can supply 250,000 kWh (or whatever his yearly output may be) at a penny per kWh without initial charge, though I doubt it, but he would not make much profit if he supplied 25 kWh only at this figure during the same period.

If he finds a firm that will make such instruments in small numbers at only two or three pounds each, either it is very foolish, or very enterprising, in looking to the future to get back first costs.

J. Daniels.

Wimbledon, *September 21st*, 1928.

If Mr. H. Wilson requires the above at a reasonable price he will, I regret to think, have to go to the Continent, and probably Germany.

I can anticipate the reply of the "ring," *i.e.*, "that watt-hour meters are standard instruments manufactured in large quantities, but the relay is a special instrument, hence the price."

A. J. Abraham,

(*Engineer and Manager*, ELECTRICITY DEPARTMENT).

Bexleyheath, *September 21st*, 1928.

Electrical Slogans.

I have read with interest Mr. Turnbull's article on the above subject, and also Mr. Payn's letter. The latter, I feel sure, has set many minds working in the endeavour to evolve a suitable slogan, and I put forward the undermentioned for the consideration of the E.D.A.:—

"Don't *Slog* On—*Switch* On."

W. J. Brooks.

Cardiff, *September 20th*, 1928.

With reference to the several letters appearing in your issue of the 21st inst., I submit a slogan which, I think, from the comments I have heard (if I may use the expression) has "caught on"; the slogan is as follows:—

"Electricity the Matchless."

J. C. Petersen.

(*Secretary*, ELECTRIC SUPPLY DEPARTMENT.)

South Shields, *September 22nd*, 1928.

With reference to the correspondence on electrical slogans, the following occurs to me:—

"Electricity—Cheap but Priceless."

S. R. R.

Cardiff, *September 21st*, 1928.

Published Specifications.

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specification will be printed and abridged and all subsequent proceedings will be taken.

1927.

4,953 "Electric switches or make-and-break contact devices." Work Meters, Ltd., and W. C. Sutherland. February 22nd, 1927. (296,317.)

5,784. "Automatic control arrangements for electric power systems." Whipp & Bourne, Ltd., and F. Whipp. March 2nd, 1927. (296,452.)

5,960. "Leading-in wires, supports, and the like for thermionic valves, electric lamps, and the like and alloys for same." W. Dawson. March 3rd, 1927. (296,453.)

7,341. "Direction production of caoutchouc by electrophorectic means." Anode Rubber Co., Ltd. (in liquidation) (P. Klein). March 16th, 1927. (296,138.)

13,967. "Sound-transmitters involving the use of light waves." J. Neale. May 24th, 1927. (296,323.)

14,202. "Electromagnetic relays." Igranic Electric Co., Ltd. and J. H. Abbink-Spaink. May 26th, 1927. (296,324.)

14,305. "Signalling apparatus, 'pips' order-telegraph and steering indicators and other distant control indicators." B. Hocken. May 27th, 1927. (Cognate application 14,307/27.) (296,325.)

14,429. "Electrolytic cells." Allen Electrolytic Cell Corporation. July 3rd, 1926. (273,672.)

14,554. "Electric induction furnaces." E. F. Northrup. May 30th, 1927. (296,464.)

14,626. "Armatures for dynamo-electric machines." W. B. Sayers. May 31st, 1927. (296,390.)

14,630. "Electric protective apparatus." British Thomson-Houston Co., Ltd., and H. S. Petch. May 31st, 1927. (Patent of addition not granted.) (296,465.)

14,757. "Remote radio control devices." A. B. Blinkhorn. June 1st, 1927. (296,475.)

14,830. "Electrical apparatus such as relays and the like." Westinghouse Brake & Saxby Signal Co., Ltd. October 7th, 1926. (278,667.)

14,884. "Electric relays." Automatic Telephone Manufacturing Co., Ltd., and T. H. Turney. June 2nd, 1927. (296,476.)

14,948. "Alternating-current dynamo-electric or converting machinery." Electric Construction Co., Ltd., L. J. Hunt, and W. Tonkinson. June 7th, 1927. (296,481.)

15,316. "Method of and arrangement for regulating the number of revolutions of electric induction motors." E. Wist. June 8th, 1927. (296,488.)

16,383. "Electric oscillation motors." F. B. Dehn (Losenhausenwerk Dusseldorfer Maschinenbau Akt. Ges.). June 20th, 1927. (296,501.)

16,990. "Enclosed electric switchgear and similar appliances." Simplex Conduits, Ltd., and H. F. McLoughlin. June 27th, 1927. (296,506.)

17,027. "Electric selecting devices." Siemens Bros. & Co., Ltd., and C. R. Riber. June 27th, 1927. (296,508.)

17,178. "Welding electrodes." O. Y. Imray (E. M. F. Electric Co., Proprietary, Ltd.). June 28th, 1927. (296,509.)

18,396. "High-frequency electrical apparatus of the type employing multiple electrode vacuum electric discharge devices." W. J. Brown and Metropolitan-Vickers Electrical Co., Ltd. July 11th, 1927. (296,516.)

18,822. "Electric insulating studs or rods." British Thomson-Houston Co., Ltd. July 20th, 1926. (274,851.)

19,383. "Electric control systems." Igranic Electric Co., Ltd., S. R. Wright and L. E. Currah. July 21st, 1927. (296,531.)

19,940. "Water-cooled mercury vapour arc lamps." A. K. Croad (Hanovia Chemical and Manufacturing Co.). July 27th, 1927. (296,527.)

20,256. "Method and apparatus for energising thermionic valves." L. Koros. May 30th, 1927. (291,345.)

22,173. "Method of and means for manufacturing telephone cables." Siemens-Schuckertwerke Akt. Ges. August 24th, 1926. (276,665.)

22,890. "Electrically-heated ovens." G. Melville and Measurement, Ltd. August 31st, 1927. (296,552.)

23,126. "Reflectors for electric fires and radiators." H. H. Berry. September 2nd, 1927. (296,556.)

23,547. "Relay for controlling auxiliary circuits of alternating-current installations." Siemens-Schuckertwerke Akt. Ges. September 11th, 1926. (277,345.)

24,083. "Shades and/or reflectors for electric lamps." F. Staines. September 13th, 1927. (296,560.)

24,874. "Electrically-operated wind-screen wipers." J. Lucas, Ltd., and S. A. Mason. September 21st, 1927. (296,567.)

28,991. "Electric condensers for selective wireless reception." F. Koch. October 31st, 1927. (296,591.)

30,542. "Rectifying units for electric current." Siemens-Schuckertwerke Akt. Ges. and G. Scharowsky. November 14th, 1927. (296,596.)

31,275. "Manufacture of poles for the magnets of electric motors or the like." L. Holland. June 15th, 1927. (292,135.)

32,071. "Quick-acting electric switches." G. Hezez. January 12th, 1927. (283,518.)

32,109. "Electric motor controllers." T. E. Barnum. April 11th, 1927. (288,537.)

32,596. "Amplifying horn and moulding process and apparatus for the production of same." Temple, Inc. August 1st, 1927. (294,925.)

33,456. "Method of and apparatus for the conversion of mechanical measuring values into the corresponding electrical measuring values." Askania-Werke Akt. Ges. vorm. Centralwerkstatt Dessau und C. Bamberg-Friedenau. December 21st, 1926. (282,654.)

33,565. "Safety systems for electric elevators." British Thomson-Houston Co. Ltd. December 15th, 1926. (282,389.)

34,083. "Electric illuminating devices for advertising and the like." G. F. Becker. December 16th, 1927. (296,607.)

34,265. "Electric batteries." Berliner Batterie-Fabrik Ges. April 13th, 1927. (288,597.)

34,608. "Electric discharge devices." British Thomson-Houston Co., Ltd. December 27th, 1926. (282,754.)

35,233. "Process for manufacturing devices provided with a layer of oxide and conducting electric current in one direction only." Siemens-Schuckertwerke Akt. Ges. December 31st, 1926. (282,815.)

35,479. "Electric heating plate." Steatit-Magnesia Akt. Ges. January 8th, 1927. (283,209.)

1928.

92. "Cushioned glass jars or receptacles for galvanic batteries." J. E. Marsden. January 2nd, 1928. (296,613.)

181. "Method and apparatus for the measurement of distances by the use of electromagnetic waves." A. Koulikoff and C. Chilowsky. April 6th, 1927. (288,233.)

2,439. "Automatic overload electric circuit-breakers." F. Perrotti. January 25th, 1928. (296,623.)

2,560. "High-tension electric cables." Siemens Schuckertwerke Akt. Ges. February 12th, 1927. (285,075.)

3,173. "Automobile headlamps." J. Borel. June 8th, 1927. (291,754.)

3,823 "Electric heaters." British Thomson-Houston Co., Ltd. February 9th, 1927. (285,034.)

5,296. "Resistance alloys." British Thomson-Houston Co., Ltd. February 25th, 1927. (285,908.)

7,753. "Full-wave electrolytic rectifiers." S. D. White and R. J. Jones. March 13th, 1928. (296,640.)

7,754. "Electrolytic rectifiers." S. D. White and R. J. Jones. March 13th, 1928. (296,641.)

7,883. "Regulation of electric arcs." M. Gobert. March 14th, 1928. (296,642.)

8,702. "Attachment for electrically-driven sewing-machines." Singer Manufacturing Co. September 16th, 1927. (296,646.)

9,027. "Lightning conductors." W. Pickard and R. Spencer. March 26th, 1928. (296,647.)

13,051. "Marine telephone cables with incorporated Pupin coils." Siemens-Schuckertwerke Akt. Ges. July 23rd, 1927. (294,464.)

13,419. "Pupin-coil sections for marine telephone cables." Siemens-Schuckertwerke Akt. Ges. June 28th, 1927. (292,971.)

16,148. "Photo-electric cell and other electric discharge devices." Westinghouse Electric and Manufacturing Co. June 8th, 1927. (291,763.)

20,738. "Electric filter circuits." British Thomson-Houston Co., Ltd. July 19th, 1927. (294,177.)

Trade Mark Applications.

THE following are among the recent applications for British trade marks. Objections against either of the proposed marks may be entered within one month from September 19th:—

David (lettering and design). No. 491,713. Class 6. Electrical machinery.—Chesterton, Jones & Co. Ltd., 44-45, Littleton Street, Walsall.

Octrate. No. 492,487. Class 8. Radio-telephonic receiving sets.—M.P.A., Ltd., 62, Conduit Street, W.1.

New Work for Contractors.

Particulars of new works and building schemes for the use of electrical installation contractors in search of work and all interested in the sale of electrical and allied plant and other products.

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

ALVA.—Electric light installation, pavilion, Cochrane Park, for the T.C.; John Melvin & Son, architects, Mar Street, Alloa.

AYRSHIRE.—Extension of Morton Hall at Newmilns (£3,600); burgh surveyor.

BARNES (SURREY).—Shops, flats, and 59 garages, Upper Richmond Road; Murrell & Pigott.

BEDFORD.—Warehouse for Ammonia Fertiliser Co., Duck Mill Lane; J. T. Hobson & Co. Extensions, St. Cuthbert's Hall; Mr. E. H. C. Inskip, architect. Development, Corporate Estate; borough engineer.

BINGLEY.—Sanatorium at the Training College; Education Department, County Hall, Wakefield.

BIRKENHEAD.—Health clinic for the T.C ; Mr. R. W. Johnston, borough engineer (returnable deposit of £2 2s.).

BRISTOL.—Extensions, Frenchay Park Sanatorium (£28,450), for the T.C.; Coles Bros., builders, Bath.

BROMLEY (KENT).—Reconstruction and extension of Grand Theatre cinema, with electrical and heating work; Mr. F. C. Mitchell, architect, George Street, Portman Square, W.

CARDIFF.—Wesleyan Chapel, Rumney; trustees.

DORCHESTER.—Electric light installation, St. Mary's Church; incumbent.

DUDLEY.—Additional 120 houses, Netherton, for the T.C.; borough surveyor.

DUMFRIES.—Business premises, offices. &c., King Street (£3,200), for John Hughes; T. A. Halliday, builder.

EDINBURGH.—Cinema at Corstorphine; secretary, Corstorphine Picture Houses, Ltd.

ELSTOW.—School (200 places), for Beds. E.C.; Mr. J. B. Graham, clerk, Bedford.

EVESHAM.—Senior elementary school; Worcestershire Education Committee.

GLASGOW.—New school at Govanhill for Education Authority; Master of Works, Education Authority office, Bath Street. 500 steel houses; Atholl Steel Houses, Ltd. Housing scheme (138), Meikle, Aitkenhead, Cathcart, for Western Heritable Investment Co. Schools, Elba Lane and Springfield Road, for Education Authority. Housing scheme (70), King's Park Avenue, for McTaggart and Mickel, Ltd.

GREENOCK.—Additions at Ladyburn Tanworks (£6,000); the manager.

HARPENDEN.—Works extensions, Leyton Road, for Abbotts, Ltd., oilskin clothing manufacturers.

HAYWARDS HEATH.—St. Paul's Roman Catholic Church, Hazelgrove Road; rector.

HERNE BAY.—Re-erection (after fire) of Pier Theatre, for the U.D.C.; surveyor.

IPSWICH.—Extensions, Cornhill, for Footman, Petty & Co., drapers, Waterloo House.

IRISH FREE STATE (DUBLIN).—Housing scheme (66), Glasnerin (deposit £5 5s.).; chief clerk, Irish Sailors' and Soldiers' Land Trust, 50, Upper Mount Street.

(KILKENNY).—Housing scheme (30); Mr. R. Murphy, borough architect, City Hall.

LONDON (ISLINGTON, N.).—Modified public hall scheme (£35,000); borough architect.

(STOKE NEWINGTON, N.).—Factory for Ever Ready Co., Ltd., Carysfort Road; H. Seymour Couchman & Sons. Workshop and garages, 172, Albion Road; Boxall & Boxall. Buildings at St. Olave's Church, Seven Sisters Road; Mr. G. T. Hellicar for Rev. D. G. B. Macrae.

(FULHAM, S.W.).—Extensions, destructor works; F. Braby and Co., and borough engineer. Buildings at Macfarlane Lang's biscuit works, Townmead Road; J. M. Monro and Sons. Buildings, corner Hammersmith Road and Addison Bridge Place; Mr. W. E. Sanders, 118, Camden Road, N.W.1.

(MITCHAM, S.W.—Market, shops and cinema, London Road; Owen & Fulford.

LOUTH.—Post Office for H.M. Office of Works, King Charles Street, London, S.W.

MALDON (ESSEX).—Extensions, Convalescent Home, Heybridge; Mr. J. W. Merrywest, architect, 26, Market Street, Ely, Cambs. (returnable deposit of £1 1s.).

MANCHESTER.—Enlargement of St. Brigid's R.C. School; Rev. Jos. Fitzgerald, rector. Premises for Tootal; Broadhurst Lee Co., Ltd., cotton manufacturers.

MORDEN AND CARSHALTON.—Four schools for Surrey E.C.; W. W. Finny, secretary, Kingston-on-Thames.

NORTHFLEET.—Alterations, Factory Hall; Associated Portland Cement Manufacturers, Ltd.

OLDHAM.—Extension of the Oldham Royal Infirmary; secretary. Power, chemical and filter houses, Longden filter works; waterworks engineer.

OXFORD.—Buildings, Castle Street (£5,000); G. R. Cooper, Ltd. Extensions, Church of England schools, Church Street, Hinksey; managers. Alterations, St. Aldate's school; Church of England Trust Society. Chapel, Cowley Place; Magdalen College Council. Reconstruction hostel, St. Mary's Road; St. John's House trustees. Additions to dining hall, masters' room and servery, St. Edwards School, Woodstock Road; governors. New dormitory and additions to classrooms, Rothesay boarding school, Woodstock Road; Mrs. Hickling.

PAISLEY.—Additions to La Scala picture house; the manager.

PENZANCE.—Extensions, Chapel Street; West Cornwall College governors. Housing scheme (116), York House Estate, for the T.C.; borough surveyor.

PRESTWICH.—Thirty-four houses, Bury New Road; J. & W. Leach & Sons, Ltd. Shops and flats, Bury New Road (£60,000); Ellis & Son, 1, Princess Street, Manchester. Building development, Sedgley Park; Messrs. Nield and Walker, Manchester.

REDDITCH.—Secondary school; Worcestershire Education Committee.

RICHMOND (SURREY).—Extensions, Holy Trinity Church; B. Pite, architect, 101, Great Russell Street, W.C. 144 flats and 50 garages, Gloucester House Estate, Kew Road; R. Gibson.

SHOEBURYNESS.—Extensions, Conservative Club; Ernest Read & Sons, architects, 197, West Road (returnable deposit of £1).

SHREWSBURY.—Primitive Methodist Church, Ditherington; trustees.

SOUTHAMPTON.—Town Hall for the T.C.; Mr. E. B. Webber, architect, 2, New Square, London, W.C.2.

STOCKPORT.—Extensions for the B.G.; Peirce & Son, architects, 30, St. Petersgate.

STOURBRIDGE.—Elementary school; Worcestershire Education Committee. Central school, Church of England authorities.

SWANSEA.—200 houses, Townhill Estate; borough architect. Development, Garnlas Estate; Sir T. R. A. Morris. Alterations and additions, 11 & 12, Wind Street; National Provincial and Union Bank of England, Ltd. Reconstruction, municipal offices, Somerset Place; borough architect.

TROWBRIDGE.—Reconstruction of premises, Fore Street, for F. W. Woolworth & Co., Ltd., bazaar proprietors, Kingsway, London. Creamery, for Messrs. Walden, Hilperton.

WAKEFIELD.—Warehouse, for R. S. Dyson & Co., Ltd., Burrell Street; Mr. F. Simpson

WANTAGE.—School and special subjects centre for Berkshire E.C.; Mr. W. C. F. Anderson, secretary, Shire Hall, Reading (returnable deposit of £2 2s.).

WAVERTON (CHESTER).—Electric light installation, Presbyterian church and manse; Walter Dean, Brown Heath Road.

WELLINGBOROUGH.—Housing scheme (26), for the U.D.C.; surveyor.

WELWYN GARDEN CITY.—Additional 100 houses for the U.D.C.; surveyor.

WEYMOUTH.—Alterations, Liberal Association premises, Lower Bond Street; Andrews & Andrews.

WIGAN.—Café, restaurant, &c., with electric passenger lift, for the Savoy Café Co. (Wigan), Ltd.; George Hargreaves, secretary, Clarence Chambers, Wallgate.

WINSLOW.—Works (£40,750), for the Buckingham Brick and Tile Co., Ltd., H. C. Burdett, of Burdett (Walton), Ltd., chairman.

WOODFORD.—Headquarters for Essex Territorial Army Association; George Shenstone, architect, London (returnable deposit of £2 2s.). Pavilion, Bancroft School; governors.

YEOVIL.—Additional 120 houses for the R.D.C.; surveyor. Beet sugar factory; U. de Berker.

YORK.—Additions, Feasegate Restaurant; York Coffee House Co., Ltd. Additions, Training College, Lord Mayor's Walk; St. John's trustees. Additions, Clementhorpe; J. Terry & Sons, Ltd. Extensions, St. John's Training College (£10,000); Rev. H. Walker, principal.